

BIOLOGICAL ASSESSMENT

Forest-Wide Invasive Plants Treatment Project



Noxious Invasive Field Bindweed within Yosemite Toad Critical Habitat

**Federally designated threatened and endangered species
and their designated critical habitat**

Fresno, Inyo, Madera, Mono and Tulare Counties, California
Esmeralda and Mineral Counties, Nevada

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Executive Summary

The Inyo National Forest (Inyo NF) is preparing an environmental assessment (EA) to adopt a Forest-wide invasive plant treatment program across the Inyo National Forest (hereafter referred to as the “Proposed Action”). Non-native invasive terrestrial plant species are among the most significant environmental and economic threats facing our Nation’s forest, grassland, and aquatic ecosystems. Invasive plants are defined in Executive Order 13112 as “non-native plants whose introduction does or is likely to cause economic or environmental harm or harm to human health.” Invasive plants compromise the ability to manage public lands for a healthy native ecosystem. Invasive plants can create a host of environmental effects that can be harmful to native ecosystem processes, including: displacement of native plants; reduced functionality of habitat and forage for wildlife and livestock; increased potential for soil erosion and reduced water quality; alteration of physical and biological properties of soil; loss of long-term riparian area function; loss of habitat for culturally important plants; high economic cost of controlling noxious and invasive plants; and increased cost of keeping recreational sites free of noxious and invasive plant species (USDA Forest Service, 2013a).

The project provides the framework to manage invasive weed species at known locations while addressing newly detected sites. Existing infestations as well as infestations detected in the future would be prioritized for treatment based on criteria which include:

- Early invaders with high environmental impacts (per California Department of Food and Agriculture (CDFA) and Cal-IPC ratings) and/or small or few isolated infestations on the forest.
- Infestations in special status areas (e.g. Wilderness, Ancient Bristlecone Pine Forest, sage grouse or other special status species habitat) and associated points of access.
- Infestations with a high potential for future spread - prolific species found in high traffic areas such as administrative or recreation sites, trailheads, major access points for the forest, and systems vulnerable to invasion (recent fires or fuelbreaks).
- Leading edge or satellite occurrences of larger more established infestations.

The action area is defined as all National Forest System lands within the administrative boundary of the Inyo NF.

The proposed action is consistent with the 1988 Inyo NF Land and Resource Management Plan (LRMP) and the 1989 Record of Decision (ROD) as amended by the Sierra Nevada Forest Plan Amendment (SNFPA) FSEEIS and ROD (2004). The SNFPA ROD directs the Forest Service to undertake invasive plant management and to prioritize activities in the following order: 1) prevent new introductions of invasive species; 2) conduct early treatment of new infestations; and 3) contain or control established infestations (USDA Forest Service 2004, page 36).

The Forest Service Manual 2900 (USDA Forest Service 2011) directs the Forest Service to use an integrated pest management (IPM) approach for invasive species control, to develop and utilize a site-based and species-based prioritization for management of invasive species infestations, and to use a structured decision-making process and adaptive management to help identify and prioritize invasive species management approaches and actions. IPM requires integration of multiple program components- prevention, early detection/rapid response, mapping, control, re-vegetation, and monitoring- with site-specific selection of treatment methods (manual, chemical, biological, and/or cultural) based on factors including effectiveness, feasibility, ecological impact, and safety.

Additional management direction to prevent, control, and eliminate priority infestations of invasive species on National Forest system lands can be found in National and Regional Strategy documents (USDA FS 2013a; USDA FS 2013b).

The Inyo National Forest has existing procedures in place for invasive plant prevention, inventory, and monitoring as part of the IPM approach, as outlined in the Inyo NF Integrated Invasive Plant Management Strategy (2005, revised 2014). Environmental analysis under the National Environmental Policy Act (NEPA) is not required to implement these aspects of the IPM approach; the proposed action and environmental analysis in this document focuses on treatment and restoration activities.

This biological assessment is prepared based upon alternative A, the “preferred alternative”, which is supported by the EA. Following the conclusion of the pre-decisional administrative review process, if any substantive changes to the alternative are made, consultation will be re-initiated as appropriate. The Record of Decision will be issued following receipt of the final Biological Opinion for the Preferred Alternative.

This document was prepared to meet the following specific objectives:

- Comply with requirements of the Endangered Species Act of 1973, as amended, so that actions by Federal agencies do not jeopardize the existence of federally listed species, or destroy, or adversely modify their critical habitat;
- Assess the effects of the Proposed Action on federally listed species known or likely to occur on the Inyo NF or on designated critical habitat on the Inyo NF;
- Make full use of internal biological expertise and consultation with the U.S. Fish and Wildlife Service (USFWS) to reach supportable determinations of effect;
- Provide a process and standard by which to ensure that effects to federally listed species, known or likely to occur on the Inyo NF, as well as designated critical habitat, receive full consideration in the decision making process consistent with Forest Service policy (Forest Service Manual 2672.4).

Since the Proposed Action provides framework and strategy direction for the development of later site-specific projects, it is possible that some future implementation treatments could have effects to listed species or their habitat or to designated critical habitat. Annual treatments would be reviewed during the Annual Implementation Process to include resource experts and Project Design Features. Therefore, we expect that most implementation treatments would have a determination of either no affect or may affect, and not likely to adversely affect federally listed species or their critical habitat.

The determinations made for analyzed species and critical habitats are displayed in Table 1.

Table 1 Determination for analyzed species and critical habitats

Species	Status	Determination
Sierra Nevada bighorn sheep	Endangered	May affect, not likely to adversely affect
Sierra Nevada bighorn sheep critical habitat	Designated	May affect, not likely to adversely affect
Mountain yellow-legged frog, northern DPS	Endangered	May affect, likely to adversely affect
Mountain yellow-legged frog, northern DPS critical habitat	Designated	May affect, likely to adversely affect
Sierra Nevada yellow-legged frog	Endangered	May affect, likely to adversely affect
Sierra Nevada yellow-legged frog critical habitat	Designated	May affect, likely to adversely affect
Yosemite toad	Threatened	May affect, likely to adversely affect
Yosemite toad critical habitat	Designated	May affect, likely to adversely affect
Lahontan cutthroat trout	Threatened	May affect, not likely to adversely affect
Paiute cutthroat trout	Threatened	May affect, not likely to adversely affect
Owens tui chub	Endangered	May affect, not likely to adversely affect

We determined, and the USFWS agreed, that the following species were not likely to occur on the Inyo NF nor be impacted by Forest Service actions addressed in the forest plan: North American wolverine, California condor, Least Bell's vireo, Yellow-billed cuckoo, western U.S. Distinct Population Segment (DPS), Western snowy plover, Pacific Coast DPS, Delta smelt, Little Kern golden trout, Steelhead, northern California DPS, Owens pupfish.

List of Acronyms Used

CDFW: California Department of Fish and Wildlife
CFR: Code of Federal Regulations
DPS: Distinct Population Segment
ESA: Endangered Species Act
FSM: Forest Service Manual
IMP: Integrated Pest Management
EDRR: Early Detection/Rapid Response
NF: National Forest
SERA: Syracuse Environmental Research Associates
USDA: United States Department of Agriculture
USDI: United States Department of Interior
USFS: United States Forest Service
USFWS: USDI Fish and Wildlife Service

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I. Introduction

Purpose

This Biological Assessment (BA) was prepared in accordance with Forest Service Manual (FSM) direction 2672.42, and meets legal requirements under Section 7 of the Endangered Species Act of 1973, as amended, and implements regulations [19 U.S.C. 1536 (c), 50 CFR 402.12 (f) and 402.14 (c)]. The BA provides a process through which federally listed species under the Endangered Species Act receive full consideration in the decision making process.

The purpose is also to establish an Early Detection Rapid Response (EDRR) approach which would allow for rapid treatment of newly discovered target invasive plants to prevent, eradicate and or control infestations of invasive plants on the Inyo National Forest that occur in California and Nevada, using manual, mechanical, biological, and chemical control measures. Treatments would involve integrated prescriptions that generally combine the use of multiple types of methods over several years.

The purpose of this project is to reduce the extent and spread of invasive plant infestations that threaten wildland values in a timely and cost-effective manner, while protecting human health and ecosystem functions. The project would improve the ability to treat existing infestations and rapidly respond to new (currently non-existent or undocumented) invasive plant infestations and species. The project would accomplish the following objectives:

1. Treat infestations discovered since the 2007 Weed Eradication and Control Project (Weed EA; Inyo NF 2007) and subsequent to this analysis.
2. Improve treatment effectiveness and feasibility relative to past efforts by providing a broader suite of treatment options.
3. Reduce costs, difficulty, and impacts to forest resources by eradicating new infestations when they are small.

The 2007 Weed EA authorized treatment of 24 invasive plant species at 227 specific locations totaling approximately 2,570 gross infested acres on the Forest, using manual pulling, hand and power tools, and herbicide application by hand. In 2010, an additional project was approved for hand application of herbicide to newly-discovered infestations of perennial pepperweed at specific locations in the Golden Trout Wilderness. Current and historic funding has resulted in 80-125 acres of invasive plant treatment per year. Treatment is ongoing under both decisions, and has resulted in the successful eradication or control of some infestations, especially at sites with few or single individuals. The most notable successes include eradication of numerous tamarisk infestations on the forest, elimination of a small perennial pepperweed site where herbicide was applied by hand, and reduction in size of several small spotted knapweed infestations that were hand-pulled. However, there is a need for expanded treatment options, because the currently approved methods for herbicide application (hand-painting) can be prohibitively slow and labor-intensive, and have resulted in ineffective treatment of infestations of pepperweed, whitetop, and knapweeds. In addition, newly discovered infestations cannot be treated under the current decisions; notable new finds since 2007 include one small infestation of Canada thistle, and additional infestations of pepperweed, whitetop, and knapweeds.

As a result of surveys conducted for the implementation of the above decisions and other forest projects, over 1,100 additional infestations have been documented since 2007. Currently, 58 non-native invasive plant species are known to occur on the forest, and approximately 45,846 gross infested acres are mapped, with infestations ranging from a single plant to areas over 5,000 acres in size. A means of implementing an Early Detection/Rapid Response (EDRR) approach to treat newly discovered invasive plants is clearly needed. In addition, a broader variety of efficient herbicide treatment methods are necessary to accomplish the goals of eradication or control. For species with rhizomatous root systems or those that re-sprout from cut stumps or root fragments, hand application of herbicide is inefficient when there is a large number of individuals or a very dense infestation. Finally, high-risk invasive plants have been found in designated areas (e.g. Wilderness, Mono Basin Scenic Area); these invasions threaten the resource values which those designations were intended to protect.

The introduction, establishment, and spread of invasive plant species can occur unpredictably and rapidly. Many infestations are associated with infrastructure and developments, such as roads, trailheads, or buildings, where vectoring risk from people, vehicles, and equipment is high and disturbance facilitates establishment. Potential growth and spread of infestations can be highly influenced by disturbance, ranging from local road maintenance activities to fires and floods. Asher and Dewey (2005) documented annual rates of spread from 10-24% for many invasive plant species in the western United States. In addition, density of an invasive plant may increase even if the acreage does not change. Flexibility and a wider range of treatment methods are needed to manage the variety of invasive species, adapt to changing climate and environmental conditions and respond rapidly to invasive plant threats that may be currently unknown within the project area.

Location

Invasive species do not recognize land ownership boundaries and spread indiscriminately between National Forest lands and neighboring ownerships. Effective invasive plant management requires cooperation and coordination between adjacent public land managers (federal, state, county) and private landowners. Currently, invasive plant treatments are being conducted by BLM and NPS, Inyo-Mono County, Caltrans, California State Parks, and LADWP on adjacent lands or right of ways (ROW) on the Inyo NF. In addition, many permittees and licensees on the Inyo NF are required to treat invasive plants within their permitted area (e.g. hydroelectric utilities, ski areas, pack-stations, recreation residences, etc.). Lack of appropriate and effective treatment by the Forest Service could lead to invasive plant spread not just on NFS lands but onto adjacent private and public lands. There is a need to improve consistency and coordination with the work being done by others to manage invasive plants within the Inyo NF administrative boundary and on adjacent lands.

The Inyo NF encompass nearly 2 million acres of National Forest System lands located in the southeastern Sierra Nevada mountain range and includes the White Mountains of California and Nevada. The forest includes approximately 967,039 acres of designated wilderness areas.

The Forest-wide Invasive Plant Treatment project would be ongoing, covers the entire Inyo NF, and includes using consistent treatment methods annually to control and eradicate noxious weeds. Although locations of some weed populations are currently known, locations of where and when future infestations will occur are not known.

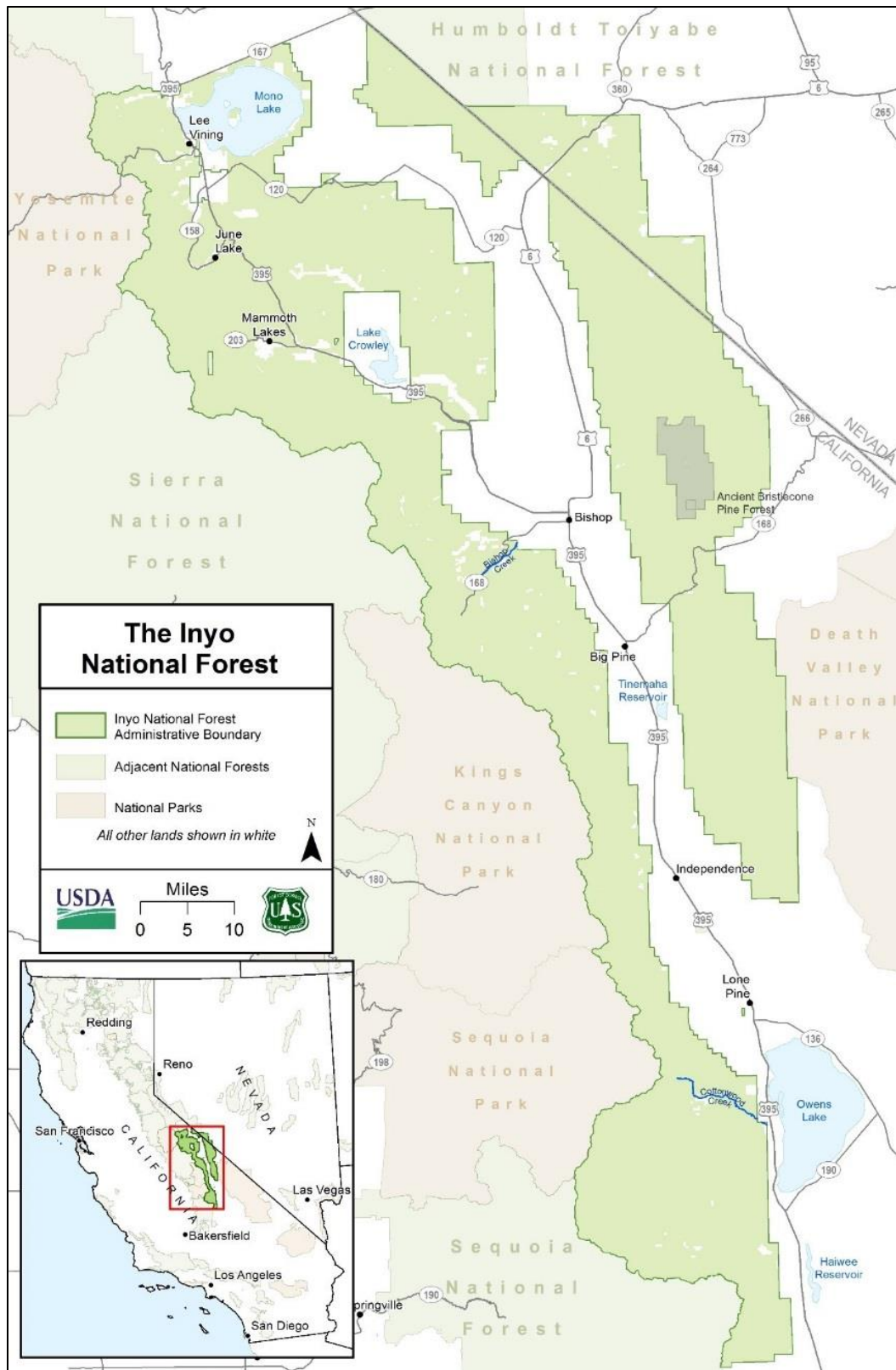


Figure 1 Project Area Map for the Forest-Wide Invasive Plant Treatment Project

Species Considered

A list of species and designated or proposed critical habitats considered for this biological assessment was obtained from the USFWS Information for Planning and Consultation (IPaC) website (<https://ecos.fws.gov/ipac/>) on March 27, 2018. This species list is equivalent to the recent consultation (November 5, 2017) for the Inyo NF Forest Plan Revision involving the Carlsbad Fish and Wildlife Office, the Reno Fish and Wildlife Office, and the Sacramento Fish and Wildlife. This resulted in a combined list of 17 threatened, endangered, and candidate species. No species proposed for federal listing were identified. It was determined that only eight of these species are known to occur in the forest plan area or have habitat within the plan area that may be affected by Inyo NF actions; therefore these eight species will be carried forward and analyzed in detail in this biological assessment (Table 2). The remaining nine species are not known to occur in the forest plan area, nor do they have proposed or designated critical habitat within the plan area and are therefore not affected by the proposed action and are not analyzed in this biological assessment (Table 3). The list of species that did not require analysis for the Inyo NF Forest Plan Revision was confirmed by the USFWS Reno Fish and Wildlife Office on April 28, 2017 and the same approach is carried forward in this project's biological assessment.

Table 2 Federally Designated Threatened, Endangered, Proposed, and Candidate Species that Occur or are Analyzed for the Forestwide Invasive Plant Treatment Project

Common Name ¹	Scientific Name	Status ²
Sierra Nevada bighorn sheep	<i>Ovis canadensis sierrae</i>	E
Mountain yellow-legged frog, northern DPS	<i>Rana muscosa</i>	E
Sierra Nevada yellow-legged frog	<i>Rana sierrae</i>	E
Yosemite toad	<i>Anaxyrus canorus</i>	T
Lahontan cutthroat trout	<i>Oncorhynchus clarkii henshawi</i>	T
Paiute cutthroat trout	<i>Oncorhynchus clarkii seleniris</i>	T
Owens tui chub	<i>Gila bicolor snyderi</i>	E

Table 3 Federally Designated Threatened, Endangered, Proposed, and Candidate Species that will not be Analyzed for the Forestwide Invasive Plant Treatment Project.

Common Name ¹	Scientific Name	Status ³
North American wolverine	<i>Gulo gulo luscus</i>	P
California condor	<i>Gymnogyps californianus</i>	E
Least Bell's vireo	<i>Vireo bellii pusillus</i>	E
Yellow-billed cuckoo, western U.S. DPS	<i>Coccyzus americanus</i>	T
Western snowy plover, Pacific Coast DPS	<i>Charadrius nivosus nivosus</i>	T
Delta smelt	<i>Hypomesus transpacificus</i>	T
Little Kern golden trout	<i>Oncorhynchus aquabonita whitei</i>	T
Steelhead, northern California DPS	<i>Oncorhynchus mykiss</i>	T
Owens pupfish	<i>Cyprinodon radiosus</i>	E

Table 4 identifies final designated critical habitat that occurs within the plan area identified for four species in the species lists. Table 5 identifies final designated critical habitat for five species identified in the species lists that do not overlap the plan area and will not be affected by the proposed action and are not addressed in this document. There is no proposed critical habitat that overlaps the plan area.

Table 4 Designated Critical Habitat Analyzed for the Forestwide Invasive Plant Treatment Project

Species	critical habitat Status
Sierra Nevada bighorn sheep	Final Designated critical habitat
Mountain yellow-legged frog, northern DPS	Final Designated critical habitat

¹ DPS = Distinct Population Segment

² E = Endangered; T = Threatened; C = Candidate

³ E = Endangered; T = threatened; PT = Proposed Threatened

Sierra Nevada yellow-legged frog	Final Designated critical habitat
Yosemite toad	Final Designated critical habitat

Table 5. Designated Critical Habitat that is not analyzed in the Forestwide Invasive Plant Treatment Project

Species	critical habitat Status
California condor	Final Designated critical habitat
Least Bell's vireo	Final Designated critical habitat
Yellow-billed cuckoo, western U.S. DPS	Final Designated critical habitat
Western snowy plover	Final Designated critical habitat
Owens tui chub	Final Designated critical habitat

One species has had recent petition decisions that found that listing under the Endangered Species Act was not warranted: Bi-State population of greater sage-grouse (*Centrocercus urophasianus*) (United States Department of the Interior 2015b). The Inyo NF will conclude conferencing on the proposed BSSG and critical habitat, as outlined in 50 Code of Federal Regulations Section 402.10 for compliance with Section 7(a)(4) of the Endangered Species Act. This species is a Forest Service Sensitive species for the Inyo NF and continues to support the BSSG Action Plan. Conservation approaches, plan direction, and consequences are addressed in the biological evaluation (USDA, 2018).

II. Consultation History

Consultation with the USFWS is required for federal actions that may affect federally listed threatened and endangered species, or proposed species or their critical habitat under the ESA. Worth noting is that although the Inyo NF has and continues to manage noxious weeds, none of these projects triggered consultation. The following summarizes the informal and formal consultation conducted for this forest-wide biological assessment.

- On October 16, 2018, the Inyo NF submitted the biological assessment to the USFWS, Reno Office to initiate the formal consultation process upon acceptance.

III. Background

Non-native invasive terrestrial plant species are among the most significant environmental and economic threats facing our Nation's forest, grassland, and aquatic ecosystems. Invasive plants are defined in Executive Order 13112 as "non-native plants whose introduction does or is likely to cause economic or environmental harm or harm to human health." Invasive plants compromise the ability to manage public lands for a healthy native ecosystem. Invasive plants can create a host of environmental effects that can be harmful to native ecosystem processes, including: displacement of native plants; reduced functionality of habitat and forage for wildlife and livestock; increased potential for soil erosion and reduced water quality; alteration of physical and biological properties of soil; loss of long-term riparian area function; loss of habitat for culturally important plants; high economic cost of controlling noxious and invasive plants; and increased cost of keeping recreational sites free of noxious and invasive plant species (USDA Forest Service, 2013a).

The proposed action is consistent with the 1988 Inyo NF Land and Resource Management Plan (LRMP) and the 1989 Record of Decision (ROD) as amended by the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (2004). The Inyo NF is currently in the process of adopting a new Forest Plan and discusses any similarities that are expected to be brought forward that contribute to this projects, the conservation protection measures and relevant standards and guidelines. The SNFPA ROD directs the

Forest Service to undertake invasive plant management and to prioritize activities in the following order: 1) prevent new introductions of invasive species; 2) conduct early treatment of new infestations; and 3) contain or control established infestations (USDA Forest Service 2004, page 36).

The Forest Service Manual 2900 (USDA Forest Service 2011) directs the Forest Service to use an integrated pest management (IPM) approach for invasive species control, to develop and utilize a site-based and species-based prioritization for management of invasive species infestations, and to use a structured decision-making process and adaptive management to help identify and prioritize invasive species management approaches and actions. IPM requires integration of multiple program components- prevention, early detection/rapid response, mapping, control, re-vegetation, and monitoring- with site-specific selection of treatment methods (manual, chemical, biological, and/or cultural) based on factors including effectiveness, feasibility, ecological impact, and safety.

Additional management direction to prevent, control, and eliminate priority infestations of invasive species on National Forest system lands can be found in National and Regional Strategy documents (USDA FS 2013a; USDA FS 2013b).

The Inyo National Forest has existing procedures in place for invasive plant prevention, inventory, and monitoring as part of the IPM approach, as outlined in the Inyo NF Integrated Invasive Plant Management Strategy (2005, revised 2014). Environmental analysis under the National Environmental Policy Act (NEPA) is not required to implement these aspects of the IPM approach; the proposed action and environmental analysis in this document focuses on treatment and restoration activities.

IV. Proposed Action

The Proposed Action is to annually treat a portion of the invasive plant infestations on the Inyo NF. The number of infestations and acreages treated each year will depend upon available funding; current and historic funding has resulted in ~80-125 acres of invasive plants treated per year. Annual treatment area is expected to be at least within the range of acreage for previous years, but may increase given the additional methods available under this project and the potential enhanced pace and scale of restoration currently under consideration for the revised Inyo NF Land and Resource Management plan (USDA Forest Service, 2017). Potential increases in treatment areas would be contingent on funding, and partnerships may be increasingly relied upon for treatments.

Proposed treatments will follow an Integrated Pest Management (IPM) approach, which combines prevention, control, and restoration measures. Control measures would involve integrated prescriptions that typically combine the use of manual, mechanical, cultural, and chemical methods over several years. Herbicides are used only after monitoring indicates they are needed, and treatments are made with the goal of removing only the target organism. Herbicides are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.

Restoration measures are also an essential component of the proposed IPM approach. Restoration measures may include seeding of native species, planting of potted or bare-root plants, or mulching with certified weed- and weed-seed-free native mulch, plant litter, duff, or straw/wood shred.

Treatments of newly discovered (currently unmapped) infestations or species of invasive plants would occur according to the Early Detection Rapid Response (EDRR) approach, which is designed to allow for control of new invasive plant infestations as soon as possible after their detection. EDRR treatments could occur outside of currently mapped areas and for species currently unknown on the forest, but these treatments would be subject to an Annual Implementation Process. Often, several years of treatment are required to eradicate or control an infestation. Each treatment would be subject to modification by Project Design Features, which define the set of conditions or requirements that the proposed activities must meet to avoid or minimize potential effects on sensitive resources.

Project Area

This project covers all lands administered by the Inyo NF. Areas proposed for treatment fall into three categories:

- 1) Currently mapped infestations. A total of 45,846 acres are currently mapped as infested with invasive plants as of early 2018.
- 2) Growth of mapped infestations. Where there are limited resources to accomplish treatments, infested areas will generally continue to increase in size, as described in the Purpose & Need section. The proposed action would allow for treatment of these enlarging infestations, depending on prioritization and resources available.
- 3) Infestations discovered subsequent to this analysis. The proposed action would allow for treatment of newly discovered (currently unmapped) infestations or species of invasive plants as described under the EDRR section.

While the majority of the Forest and therefore invasive species treatments would be in Mono and Inyo Counties, the Forest also covers portions of Fresno, Madera and Tulare Counties in California, and Esmeralda and Mineral Counties in Nevada.

Treatment Strategy

Infestations would be prioritized for treatment based on the following factors:

- Early invaders with high environmental impacts (per California Department of Food and Agriculture (CDFA) and Cal-IPC ratings) and/or small or few isolated infestations on the forest.
- Infestations in special status areas (e.g. Wilderness, Ancient Bristlecone Pine Forest, sage grouse or other special status species habitat) and associated points of access.
- Infestations with a high potential for future spread - prolific species found in high traffic areas such as administrative or recreation sites, trailheads, major access points for the forest, and systems vulnerable to invasion (recent fires or fuelbreaks).
- Leading edge or satellite occurrences of larger more established infestations.

Infestations or species that do not fit into the above categories may be targeted for treatment if resources become available, but would generally be a lower priority.

For each known or newly discovered invasive plant infestation, one of four treatment strategies would be implemented:

1. Eradicate: Annually treat and monitor the infestation with the goal of complete elimination of the species (58 acres; e.g. knapweeds, perennial pepperweed).
2. Control: Treat and monitor a portion of the infestations each year, focusing on reducing the acreage and percent cover over time (1,431 acres; e.g. tamarisk).
3. Contain: Treat leading edge or new satellite infestations, or where concurrent with high-value resources (40,175 acres; e.g. Russian thistle, cheatgrass, black locust).
4. Limited/No treatment: Limited to site-specific restoration projects or no treatment efforts at this time (4,180 acres; e.g. woolly mullein, dandelion).

The treatment strategy assigned to a particular species or infestation may change over time given the feasibility or availability of treatment methods covered in this project. It is anticipated that the vast majority of the treatments conducted under this project will be for Priority 1 and 2 invasive plant species. See Appendix A for a list of known invasive plant species on the Inyo NF and anticipated treatment strategy and methods.

Treatment Methods

The proposed Integrated Pest Management (IPM) control approach will employ a combination of treatment methods. Successful treatments often require multiple years of treatment, and sometimes require multiple treatments per year, in part due to funding and resource constraints, but also due to biological factors (e.g. presence of a seed bank, resprouting). Treatments are tailored depending on the biology of the target invasive plant species, population size and density, site type, and prior treatment effectiveness. Complete eradications typically require annual treatment over 3-5 years or longer to ensure there is no regrowth or new seed germination. Treatments aimed at reducing numbers or preventing further spread may occur on a less frequent but ongoing schedule. Design features described in Section 2.1.6 would be implemented during all invasive plant treatments.

Assuming a treatment method meets design features and is effective, practical, and cost-efficient, treatment methods would be selected in the following order of preference:

1. Manual and mechanical methods such as hand pulling and cutting
2. Cultural methods, including tarping, flaming, and light wands, which manipulate disturbance regimes to suppress invasive plants and encourage desirable species
3. Herbicide application
4. Biological control (biocontrol) methods

Non-chemical methods are typically considered feasible when populations are smaller than a few hundred plants in size, and/or when woody species are still small enough to be hand-pulled, although many factors, such as the age of the plants and number of people available to participate in the control effort are also factors. Some biennial and perennial species, either those with deep or rhizomatous roots, or those that re-sprout or regrow from root fragments, can only be effectively controlled with herbicide. See Appendix D for a list of all known invasive plant species on the Inyo NF and anticipated treatment strategy and methods.

Manual and Mechanical Methods

1. Manual removal, including hand-pulling or digging using hand tools such as shovels or hoes. This can be effective for small populations, especially for annual plants. It can be effective for the seedlings of perennials, shrubs, or trees, but usually not for mature established woody plants. For deep-rooted plants, hand tools such as a weed wrench or hoe may be used.
2. Cutting of woody species can be effective in the short-term, but often requires subsequent treatment of resprouting stems with herbicide to be effective. Hand saws may be used, and chainsaws may be used by certified personnel.
3. Mowing before seed set may be used to control annuals or other types of invasive plants and as a preliminary treatment to remove some biomass prior to another treatment, such as pulling, hoeing, or herbicide application. To avoid soil disturbance that encourages invasive plant growth, equipment would either be hand-held (e.g. string-trimmer) or have minimal tread, and the operator would use steering patterns that avoid rutting.
4. Clipping may be used to remove seed heads and/or fruiting bodies to prevent seed dispersal and may be used to avoid soil disturbance. When flowers or fruits are removed, they must be bagged and disposed of in a landfill to prevent seed spread.

Cultural Methods

1. Tarping or solarization involves covering the infested area with a barrier, usually plastic, to raise soil temperature and block light. Mulch, such as wood chips or rice straw, may be used to smother or shade out invasive plants. These methods can be effective for controlling small populations, especially in locations such as borrow pits or closed roads, where native vegetation is not yet established.
2. Flaming using a hand-held propane torch raises the leaf temperature to the point of bursting cells and does not require igniting vegetation. This method is applied prior to seeds becoming viable in the late winter or early spring when fire danger is low. Fire personnel would be on site for the use of this method, to provide for human safety and to ensure there is no potential for fire spread from the treated area. This method would only be considered for herbaceous species.
3. Exposing a plant to high levels of blue light using a hand-held light wand (e.g. NatureZap or similar) or mounted light system disables the photosynthesis pathway causing the plant to die.

Chemical Methods

Eight herbicides are proposed for use with species-specific targets. All herbicides proposed are registered for use in California and Nevada and would be applied according to label directions and project design features, using ground-based methods to terrestrial systems only. Proposed herbicide application methods include:

1. Hand Application: Herbicide application is conducted by a hand-held applicator and no spraying occurs, thereby limiting the likelihood of drift. For example, these methods are typically used for control of large woody species such as tamarisk and Russian olive (a and b) or for certain infestations of pepperweed, whitetop or Canada thistle that grow close to water (c).
 - a. Cut-Stump: The trunk or branches are cut through and the stump is immediately painted with herbicide. Herbicide may also be “daubed” directly on the cut surface using a sponge wand or dripped using squeeze bottles. Follow up treatment of re-sprouting stems is typically necessary on a proportion of the plants treated.
 - b. Hack and Squirt: Herbicide is applied directly to living tissue in woody species by partially cutting or drilling into a trunk or branch and painting, dripping, or injecting herbicide on exposed cambium. This method may be used when cutting stems is not possible or when it may be desirable to leave standing dead vegetation in place.
 - c. Wick/Wipe/Drip: Herbicide is applied by hand to foliage of individual plants with a brush or sponge, or dripped with a squeeze bottle. This method is primarily used for control of small infestations or portions of infestations where spray application is restricted (such as close to water or sensitive species).
2. Directed Foliar/Basal Bark Spray/Drizzle: Herbicide is applied to green foliage of individual plants or the lower portion of the trunk of woody species (basal bark) with backpack sprayers or hose sprayers attached to a mounted tank. This method uses a hand-operated spray wand with a regulator nozzle to control application of herbicide to target plants while minimizing spray between target plants. For example, this method may be used to treat infestations of knapweeds and pepperweeds, as well as tamarisk re-sprouts, or woody species such as tamarisk and Russian olive (basal bark).
3. Spot Spray: Herbicide with residual soil activity (aminopyralid or clopyralid only) is applied to the target invasive plant and adjacent soil using a sprayer wand to provide pre-emergent control of re-sprouts and seedlings. This method would be limited to sites with high percent cover of invasive plants and requires incorporation by rainfall to reach the root zone of the target species. For example, this method may be used to treat certain knapweed infestations.
4. Broadcast Foliar Spray: Herbicide is applied using a boom sprayer that is either hand-held or mounted on an ATV or vehicle. This method is only used for dense infestations where invasive plant cover is very high and risks to other resources are minimal (e.g. dense road-side infestation of knapweed with high cover). No broadcast application of chlorsulfuron, imazapyr, or triclopyr.

The most common herbicide method for mature woody species is likely to be the cut stump treatment, while the most common method for herbaceous species and seedlings of woody species is likely to be directed foliar application. The herbicide selected will be the one with the highest probability of meeting the management objectives of eradication or control while minimizing soil persistence and potential for leaching, restrictions for use in grazing areas, risk of affecting non-target species, and risk to applicator safety. Tank mixtures may be used if permitted by the label and when existing written recommendations are available from State Agriculture Departments or other official resources such as Universities and County Cooperative Extensions.

The Pacific Southwest Regional Policy for Pesticide Use Management and Coordination (USDA Forest Service, 2014) includes the following policies for pesticide use in California:

1. Only use pesticides registered by both the state of California and the U.S. Environmental Protection Agency, and adjuvants registered by the state of California.

2. Follow all federal and state of California pesticide-related laws and regulations and USFS policies in planning and implementing pesticide application.
3. Pesticide-use training and certification is required for Forest Service employees who use, or directly supervise the use of pesticides on Forest Service lands within California will be accomplished through California's pesticide applicator certification program.

Each herbicide prescription proposed for use will be submitted to the Forest Supervisor in a Pesticide Use Proposal form for approval (PUP; FS-2100-2; FSM 2150) and will be reviewed annually. Proposed uses and implemented applications will be submitted to the respective County.

Adjuvants

Most herbicide applications are more effective when combined with adjuvants (solution additives), such as surfactants and marker dye. These additives improve the mixing, application, or effectiveness of an herbicide. Surfactants enhance activity of an herbicide's active ingredient by facilitating and enhancing the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of the herbicide. Marker dyes are used to visually confirm the location of the herbicide application; this assists the applicator in limiting the application to the target plants and reduces risk of application to non-target areas.

This project will use a methylated seed oil (MSO) type surfactant. Trade formulations of MSO surfactants include Hasten and Competitor. This type of surfactant is being used due to the favorable environmental profile. No petroleum or petrochemical-based surfactants would be used. No POEA surfactants (the surfactant found in the commercial glyphosate formula RoundUp) would be used. A water-soluble dye, such as Highlight Blue or Colorfast Purple, would be used.

Table 6 Herbicides proposed for invasive plant treatments, including herbicide characteristics and application considerations. Additional information available from Tu et al. (2001) and DiTomaso et al. (2013).

Herbicide (Active Ingredient)	Example Trade Name	Mechanism	Selectivity	Biological timing of application	Seasonal or temperature restrictions	Soil persistence (avg. soil half-life in days)	Potential for leaching	Use permitted near water? ¹	Use permitted in grazed areas? ²
Aminopyralid	Milestone	Growth regulator (auxin mimic)	Broadleaf species, particularly Asteraceae and Fabaceae	Pre- and post- emergence; For annuals, seedling stage; for perennials, when plants are fully expanded	Product should be >40°F to prevent crystalizing	35	Limited, but may leach into ground water if there are permeable soils and water table is shallow	Do not apply directly to water	Yes
Chlorsulfuron	Telar	Inhibits synthesis of certain amino acids	Broad spectrum, best on broadleaf	Pre- and post- emergence; Bud to bloom or fall rosette stage	None	28-42	Low as herbicide readily adsorbed to soil	Do not apply directly to water	Yes (maximum application rate applies)
Clethodim	SelectMax	Inhibits fatty acid synthesis	Annual and perennial grasses	Post-emergence; For annuals, seedling stage; for perennials, when plants are fully expanded	Do not apply to plants stressed by extreme high or low temperatures	3	Very low	Do not apply directly to water	Yes (delay in entry)
Clopyralid	Transline	Growth regulator (auxin mimic)	Broadleaf species, particularly Asteraceae and Fabaceae	Pre- and post- emergence; For annuals, seedling stage; for perennials, when plants are fully expanded	None; may require higher application rates during extreme temperatures	12-70, average 40	Moderate, particularly with shallow water tables	Do not apply directly to water	Yes
Fluazifop-P- Butyl	Fusilade DX	Inhibits fatty acid synthesis	Annual and perennial grasses	Post-emergence; For annuals, seedling stage; for perennials, when plants are fully expanded	Not effective in drought conditions	15	Very low	Do not apply directly to water	Yes (delay in entry)

Glyphosate	Rodeo	Inhibits synthesis of amino acids	Broad spectrum	Post-emergence; Rapidly growing plants	None	47, but no soil activity	Very low as herbicide has high adsorptive capacity	Can be applied in and around aquatic sites and wetlands	Yes
Imazapyr	Arsenal, Stalker	Inhibits synthesis of amino acids	Broad spectrum	Pre- and post-emergence; Rapidly growing plants	Late summer or fall; oils may assist in uptake during stress	25-142, depending on soil type	Low potential for leaching, but is susceptible to surface runoff, and leaching from dead roots may occur	Can be applied in and around aquatic sites	Yes (foliar treatment cannot exceed 10% of grazed area)
Triclopyr	Garlon 3A, Garlon 4	Growth regulator (auxin mimic)	Broadleaf and woody species	Post-emergence; Rapidly growing plants.	Potential for volatility increases with ambient temperature for ester formulation (Garlon 4)	30 (10-46)	Not considered to have high potential for ground or surface water contamination	TEA-Can be applied in aquatic sites BEE-Do not apply directly to water	Yes (foliar treatment cannot exceed 10% of grazed area)

¹ Per herbicide label directions. Labels do not specify distance in feet to water. Project specific herbicide buffers will be implemented (Table 3).

²Per herbicide label direction. Restrictions can vary from application rate restrictions to timing requirements, and may include delays of grazing following herbicide application.

Biological Control Agents

Biological control agents are available for some of the invasive species known on the Inyo NF (Table 2). This method involves release of natural enemies such as parasitoids, predatory insects, pathogens, or antagonists to suppress pest populations. This method generally does not eradicate invasive plant populations, but may cause stress or reduction in numbers; in addition it takes substantial coordination with other agencies. Therefore, use of biocontrol agents would likely be less common than the other methods proposed. The US Department of Agriculture, Agricultural Plant Health and Insect Services (APHIS) is the lead agency for biocontrol activities in the US, and is required to complete NEPA analysis and documentation before allowing the use of a specific biological control agent. In addition, organisms must be approved by the state agricultural department prior to their release. Prior to being permitted, biocontrol organisms must undergo considerable testing and meet strict criteria to ensure they pose no threat to non-target species. Use of this method would comply with the APHIS NEPA document and decision, would be conducted in coordination with the appropriate federal, state, and/or county agencies, and would be reviewed during the project Annual Implementation Process.

No biological control agents have previously been released on the Forest, though some organisms released on adjacent lands may have dispersed to Forest lands (e.g. Chinese leaf beetle for tamarisk control on Los Angeles Department of Water and Power lands in the Owens Valley; release of puncturevine weevil by Inyo County in 2014).

Table 7. Currently available biological control agents for invasive species known to occur on the Inyo NF (CA Department of Food & Agriculture, Pest Detection & Emergency Projects Branch, January 2018; Nevada Department of Agriculture, January 2018).

Invasive species	Biological Agent	Common Name	CA	NV
<i>Acroptilon repens</i> (Russian knapweed)	<i>Jaapiella ivannikovi</i>	Russian knapweed galling midge	x	x
	<i>Puccinia acroptili</i>	leaf and stem rust fungus		x
<i>Bromus</i> spp. (cheatgrass, red brome)	<i>Pseudomonas fluorescens</i> (ACK55)	Bacterium	x	
<i>Centaurea diffusa</i> (diffuse knapweed)	<i>Agapeta zoegana</i>	yellow-winged knapweed root moth		x
	<i>Bangasternus fausti</i>	broad-nosed seed head weevil	x	x
	<i>Chaetorellia acrolophi</i>	knapweed peacock fly		x
	<i>Cyphocleonus achates</i>	knapweed root weevil		x
	<i>Larinus minutus</i>	lesser knapweed flower weevil	x	x
	<i>Larinus obtusus</i>	blunt knapweed flower weevil		x
	<i>Sphenoptera jugoslavica</i>	knapweed root-boring beetle	x	x
	<i>Subanguina picridus</i>	stem-gall nematode		x
	<i>Urophora affinis</i>	banded knapweed seed head gall fly	x	x
	<i>Urophora quadrifasciata</i>	four-banded knapweed seed head gall fly	x	x
<i>Centaurea stoebe</i> (spotted knapweed)	<i>Agapeta zoegana</i>	yellow-winged knapweed root moth	x	x
	<i>Chaetorellia acrolophi</i>	knapweed peacock fly		x
	<i>Cyphocleonus achates</i>	knapweed root weevil	x	x
	<i>Larinus minutus</i>	lesser knapweed flower weevil	x	x
	<i>Larinus obtusus</i>	blunt knapweed flower weevil		x
	<i>Sphenoptera jugoslavica</i>	knapweed root-boring beetle		x
	<i>Terellia virens</i>	green clearwing fly	x	x
	<i>Urophora affinis</i>	banded knapweed seed head gall fly	x	x
	<i>Urophora quadrifasciata</i>	four-banded knapweed seed head gall fly	x	x
<i>Cirsium arvense</i> (Canada thistle)	<i>Hadroplontus litura</i>	Canada thistle stem mining weevil		x
	<i>Puccinia punctiformis</i>	rust fungus		x
	<i>Urophora cardui</i>	Canada thistle stem gall fly		x
<i>Cirsium vulgare</i> (bull thistle)	<i>Cheilosia corydon</i>	shoot stem and root boring fly		x
	<i>Urophora stylata</i>	bull thistle seed head gall fly	x	
<i>Linaria dalmatica</i> (dalmation toadflax) <i>Linaria vulgaris</i> (butter and eggs)	<i>Calophasia lunula</i>	toadflax moth		x
	<i>Mecinus janthiniformis</i>	dalmation toadflax stem weevil	x	x
	<i>Rhinusa antirrhini</i>	toadflax seedhead weevil		x
<i>Salsola tragus</i> (Russian thistle)	<i>Coleophora klimeschiella</i>	Russian thistle casebearer	x	
	<i>Coleophora parthenica</i>	Russian thistle stem-mining moth	x	
<i>Tamarix ramosissima</i> (tamarisk)	<i>Diorhabda carinulata</i>	northern tamarisk beetle	x	
	<i>Diorhabda elongata</i>	Mediterranean tamarisk beetle	x	
<i>Tribulus terrestris</i> (puncturevine)	<i>Microlarinus lareynii</i>	puncturevine seed weevil	x	x
	<i>Microlarinus lypriformis</i>	puncturevine stem weevil	x	

Revegetation

Revegetation of gaps in vegetation or bare areas created by invasive plant treatments is a critical component of an integrated invasive plant management strategy. In some cases, re-colonization from the existing seedbank and propagules may be sufficient; in other situations active restoration may be needed to provide competition with highly aggressive species. Revegetation of bare areas created by invasive plant treatments, particularly with perennial grass species, may suppress re-growth of invasive species. Site restoration and revegetation may be helpful in preventing re-infestation by the invasive plant that has been treated, or a new infestation by another invasive species. Revegetation will be implemented by spreading native seed, or by planting native plants, either as bare root stock or potted plants. Non-native species would not be used. Revegetation may include mulching with native litter or duff, or certified weed-free straw, raking to establish the seed bed, and treatment of invasive plants, as required, using the methods proposed above.

Monitoring

The Forest will continue to inventory invasive plant infestations and monitor treatment efficacy and will use this information to evaluate and direct eradication and control activities. Treatment effectiveness will be monitored each year using standard procedures described in the National Data Recording Protocols for Invasive Species Management, using the form shown in Appendix B. These protocols record data on the location of treatments and the percentage of the targeted invasive species population (infestation) that was controlled by the treatment. The effectiveness of each treatment would be evaluated by reviewing efficacy ratings and adjusting methods (within the parameters of the Project Decision) to improve effectiveness. For example, annual monitoring may show a need to adjust treatment timing to increase efficacy or to revise use of a particular method. Monitoring would typically continue at treated sites for at least three years with no plants found prior to determining the target species has been eradicated. Additional implementation monitoring requirements that are specific to individual resources are explained in the design features section.

Early Detection Rapid Response

The Early Detection Rapid Response (EDRR) approach is an essential component of the Invasive Plant Management Strategy and, coupled with prevention guidelines and an annually-updated inventory, will allow the Inyo NF to maintain a greater portion of the forest in an invasive plant-free condition. Under the EDRR approach, new or previously undiscovered species or infestations would be treated using the range of methods described in this Proposed Action and in accordance with the Project Design Features. EDRR is a necessary component of the Forest's treatment program because 1) the precise location of individual target plants, including those mapped in the current inventory, can change over time; and 2) new introductions and detection of previously unknown infestations will continue in the future.

The intent of the EDRR approach is to treat new infestations when they are small so that less time and resources are required for treatment, and the ecological impact is minimized to the extent possible. This approach assumes that new infestations will be similar to current infestations and will occur within the same variety of conditions, therefore treatment effects are expected to be reasonably predictable. The precise location of the treatment may be unpredictable; however, Project Design Features, intended to minimize or eliminate adverse effects that could occur, would address the broad range of circumstances under which EDRR treatments are likely to occur. EDRR treatments would be reviewed each year following the Annual Implementation Process or occasionally during the field season (following the same review process) if a high-priority infestation requiring immediate treatment is detected.

Annual Implementation Process

Annual treatments would be implemented using the Annual Implementation Process described below. This process, led by the Forest Invasive Species Coordinator, would allow resource specialists to review planned treatment methods and maps of the specific sites proposed for treatment each year, including all newly identified infestations (EDRR) and expansions of existing infestations. The Annual Implementation Process would ensure that effects are within the scope of those disclosed in the project analysis; if new proposed treatment sites would result in effects or conditions not analyzed or addressed in the project environmental analysis, those treatments would be deferred to a future NEPA analysis.

The Annual Implementation Process would include a review and documentation of proposed site-specific treatment methods and applicable project Design Features for implementation. This process integrates the strategies outlined in this EA and also satisfies pesticide use planning requirements in the Forest Service Handbook (FSH 2109.14). The following process would be followed:

1. Update Invasive Plant Database (NRIS). Findings of annual inventories and surveys, including population information and mapping, are updated in the corporate database by botany staff. (Fall/Winter)
2. Develop annual treatment plan. Treatment areas and methods would be proposed by the Forest Invasive Species Coordinator. This step would identify the preferred method(s) of treatment and an initial list of applicable Project Design Features specific to each infestation. (Winter/Spring)
3. Review of annual treatment plan. The treatment plan would be submitted to the Interdisciplinary Review Team consisting of resource specialists addressing heritage resources, hydrology, soils, botany, terrestrial and aquatic wildlife, range, and recreation resources. The submitted plan would include 1) a spreadsheet detailing site information, treatment method(s), known resource concerns, and applicable design criteria, and 2) a GIS layer of sites proposed for treatment. The team would confirm that all applicable design features are identified for each site, and would identify any changes to the proposed treatments that are needed to ensure that the effects of the proposed treatments would be within the range of those analyzed in the selected alternative. (Winter/Spring)
4. Coordination and notification. Notifications via Forest social media, or individual notifications of tribes, adjacent landowners, or permit holders as appropriate, occur to ensure awareness of upcoming invasive plant treatments. (Spring)
5. Treatment and Post-Treatment Monitoring and Adaptive Management. Treatments are implemented following all applicable design features identified for each site. Effectiveness of treatment and Project Design Features would be monitored as described in the Monitoring section (2.1.5) and the Project Design Features section (2.1.8). Adjustments to treatment methods would be proposed during the following Annual Implementation Process. (Spring/Summer/Fall)

Project Design Features

Project Design Features (DFs) define a set of conditions or requirements that an activity must meet to avoid or minimize potential effects on sensitive resources and to ensure consistency with the Forest Land Management Plan. DFs involving herbicides are an added layer of caution to the already regulated and approved use of these chemicals. DFs are not optional and application of these measures is the basis for the effects analysis for this project.

The Project DFs are based on site-specific resource conditions within the project area, including but not limited to the current invasive plant inventory, the presence of sensitive species and their habitats, proximity to water and potential for herbicide delivery to water, and the social environment. Recommended Best Management Practices from Cal-IPC (2012) were considered in the development of DFs. DFs listed are not an exhaustive list of all relevant Forest Plan Standards and Guidelines or pesticide label directions. However, project implementation will be consistent with all Forest Plan direction and will follow all herbicide label instructions. Where multiple design features apply (e.g. presence of listed amphibians and aquatic features at a site), the most restrictive design feature will be implemented in order to adequately protect all resources present.

Standard Treatment Procedures

1. Herbicides will be applied by trained and/or certified applicators in accordance with label directions and applicable federal and state pesticide laws, except where the following design features describe more restrictive measures.
2. Weather conditions (wind speed and direction, probability of precipitation, temperature, temperature inversions, atmospheric stability, and humidity) will be carefully monitored before and during herbicide applications to minimize drift, volatilization, and leaching or surface runoff of herbicides, based on label instructions.
3. Prior to the start of spray applications, all spray equipment will be calibrated to ensure accuracy of delivered amounts of herbicide. Equipment will be regularly inspected during herbicide applications to ensure it is in proper working order.
4. Herbicide spray applications will not occur when wind speeds exceed label restrictions. Use best professional judgment and consider application-specific factors (e.g. pesticide and adjuvant properties; application equipment, height, pattern and technique; target vegetation density, size, and acreage; proximity to sensitive resources; temperature and humidity; and wind speed and direction) to ensure spray applications do not result in unacceptable drift. Prior to beginning spray applications, applicators will be provided with information on local terrain and wind patterns and how they affect spray drift.
5. Herbicide application will be carefully evaluated following precipitation and/or when runoff, soil saturation, standing water, or heavy dew is present or expected, to ensure the application will not result in herbicides entering surface or groundwater. Application will occur only under favorable weather conditions, generally defined as: 30% or less chance of precipitation on the day of application based upon NOAA forecasting, rain does not appear likely at the time of application, and if rain is predicted within 48 hours, the amount does not exceed a ¼ inch.
6. Preparation of herbicides for application, including mixing, filling of wands and rinsing of equipment, will take place outside of Riparian Conservation Areas and other sensitive sites (300 ft from perennial waters, 150 ft from intermittent streams, and 25 ft from ephemeral). Herbicide preparation will occur only on level, disturbed sites.
7. A spill cleanup kit will be readily available whenever herbicides are transported or stored. Proper Personal Protective Equipment (PPE) would be worn or carried by the applicator at all times when using herbicides.
8. Streams or other surface waters will not be used for directly washing herbicide application equipment or personnel, unless required in an emergency situation.
9. Low nozzle pressure (<25 PSI) and a coarse spray producing median droplet diameter of >500 microns will be used in order to minimize drift during herbicide applications.
10. The herbicide spray nozzle will be kept as close as possible (within 20 inches) to target vegetation to limit overspray and drift to non-target vegetation.
11. When invasive plants are manually removed, methods that prevent seed spread or resprouting will be used. If flowers or seeds are present, the plant will be pulled carefully to prevent seeds from falling and will be placed in an appropriate container for disposal. If no flowers or seed heads are present the invasive plant may be pulled and placed on the ground to dry out.
12. Equipment, vehicles, clothing, and personal items will be inspected and cleaned as necessary to ensure they are free of soil, seeds, vegetative matter or other debris prior to entering new treatment areas or moving from one infestation to another.

Recreation and Public Land Uses

13. The public will be notified about upcoming herbicide treatments via Forest social media, individual notifications, or posting signs, as applicable. Cautionary signs will be placed at treatment areas and access points prior to initiating treatment when infestations are located near developed/established recreation sites or other high visitation areas. Signs will list herbicides used, target species, application date, and name and phone number of Forest contact.
14. Treatments at special use sites, developed recreation sites, and areas of concentrated public use will be scheduled to avoid weekends and holidays and high use periods of the day. Permittees or Recreation Managers will be notified prior to treatments so that treatments can be scheduled to minimize conflicts.
15. Tribes will be notified of proposed herbicide treatments during the Annual Implementation Process to ensure that plant gathering areas and other sensitive sites are protected. Areas of concern will either be avoided or appropriate treatment measures will be developed in consultation with the tribes.

Heritage Resources

16. The Forest Archaeologist will be consulted during the Annual Implementation Process to ensure specific proposed treatments are implemented in a manner to avoid effects to historic properties.

Terrestrial and Aquatic Wildlife Resources

Federally Threatened or Endangered Amphibians (Sierra Nevada yellow-legged frog (SNYLF), northern (DPS) Mountain Yellow-Legged Frog (MYLF) and Yosemite Toad (YT))

17. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within SNYLF, MYLF or YT designated critical habitat or within 500 feet of known occurrences. Treatment strategies in these areas, including applying buffers, limited operating periods, and relocating individual amphibians, will be developed collaboratively on an annual basis by the Noxious Weed Coordinator and the Forest Fisheries Biologist to ensure treatment efforts minimize or avoid impacts to frog and toad populations and critical habitat.

In occupied habitat the following restrictions apply:

20. Immediately prior to any treatment activities, a Forest Service biologist who is trained in identifying and handling rare amphibians will survey the area for SNYLF, MYLF and YT. If individuals are found they will be relocated to a safe location that is nearby but out

of potential harm’s way from treatment activities. In most cases this will be less than 100 feet from the original location of the amphibian.

21. Chemical treatments within 50 feet of active breeding locations for SNYLF, MYLF and YT would be limited to direct foliar, spot spray, or hand application of glyphosate, imazapyr, or triclopyr-TEA at all times for SNYLF and MYLF, and until after metamorphosis for YT. Metamorphosis of YT typically occurs around July 31st and will be confirmed with a site-specific survey prior to treatment.

Federally Threatened or Endangered Fish (Lahontan and Paiute cutthroat trout (LCT and PCT) and Owen’s tui chub)

23. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within 300 feet of occupied LCT, PCT, and Owen’s tui chub streams, to ensure treatments follow design features outlined below.
24. Chemical treatments within 50 feet of LCT, PCT, and Owen’s tui chub occupied habitat would be limited to direct foliar, spot spray, or hand application of glyphosate, imazapyr, or triclopyr-TEA.

Federally Threatened or Endangered Terrestrial Wildlife – Sierra Nevada bighorn sheep (SNBS)

25. Within SNBS critical habitat that contain PCEs: manual treatment is the preferred method and herbicide application would be limited to direct foliar or hand application.
26. To minimize disturbance to SNBS, treatments will not be conducted in known occupied lambing habitat during the lambing period, which typically occurs between April and mid-July.

Terrestrial Wildlife – Other

27. Invasive plant treatments will be avoided in sage-grouse habitat during the breeding (March 1 – May 1) and nesting (May 1 – June 15) seasons (INF Sage-Grouse Interim Management Policy, 2012). Site-specific exceptions may be allowed if reviewed and approved by the Forest or District Wildlife Biologist.

Botanical Resources

28. During the Annual Implementation Process, the Forest Botanist will review treatment sites that are within 500 feet of TES plant occurrences. The treatment method(s) shall be designed to avoid impacts to TES plants. Herbicide spray applications would not occur within 100 feet of TES plants for broadcast application or within 50 feet for direct foliar/spot application. Modifications may be made by the Forest Botanist; selectiveness of herbicide, timing of application, protective barriers, etc. could be used to reduce the risk of herbicide effects on adjacent sensitive plants.
29. Where treatments occur within or directly adjacent to TES plant occurrences, a Botanist will instruct workers in the proper identification of TES plant species to ensure that individual plants are avoided/protected.
30. Where determined necessary based on habitat suitability, surveys will be conducted for TES plant species in the vicinity of treatment areas prior to treatment.
31. If treatments occur within and adjacent to TES plant occurrences, the forest will implement monitoring designed to detect positive and negative impacts to TES plant occurrences. These results will be reported for the TES plant occurrence in the appropriate national database (e.g. NRIS) and utilized to adapt prescriptions during future treatments.

Soil and Water Resources

32. Herbicide application will not occur within the buffers for aquatic features shown in Table 3.
33. Areas of bare soil created by the treatment of invasive plants will be evaluated for restoration and revegetation by a Botanist and Soil Scientist or Watershed Specialist. Restoration measures, such as native plantings, seeding, or application of weed-free ground cover, will be implemented as needed.
34. State and Regional Water Quality Control Board certified Best Management Practices will be implemented (Appendix C). BMPs applied to all Forest projects are outlined in the Water Quality Management for Forest System Lands in California, BMP handbook and the National Core BMP Technical Guide (USDA Forest Service, 2012).
35. Mixing or application of herbicides will not occur within 100 feet of a well or spring used as a domestic water source. Applicators will be briefed about the locations of domestic water sources prior to beginning work and buffers will be flagged on the ground.
36. During the Annual Implementation Process, the Forest Watershed Specialist will review the treatment sites to determine if they occur on soils with low permeability and/or high water table. Broadcast and spot spray of aminopyralid and clopyralid would not occur in these areas.
37. Hand pulling or wrenching of invasive plants along streambanks or natural lake or pond shorelines will not exceed 20 percent of the stream reach or 20 percent of the shoreline.

Range Management

38. The Forest rangeland specialist will be notified annually of the proposed treatment schedule. Grazing permittees will be provided with treatment information (location, schedule and labels) each grazing season as part of Annual Operating Instructions for Grazing Permits.

Wilderness and Research Natural Areas

39. Manual removal of invasive plants will occur within designated or recommended Wilderness areas and RNAs whenever possible. If it is determined that manual treatments will not be effective, an MRDG will be completed and Regional Forester approval is required for any herbicide use or biological control within a Wilderness Area (FSM 2320) or RNA (FSM 2150.44).
40. District wilderness staff will be notified annually of proposed treatments in Wilderness areas.
41. Non-manual methods (mechanical, cultural, herbicide, and/or biocontrol) would be proposed to treat an invasive species within Wilderness only when:

- a. The invasive species poses ecosystem-level threats to Wilderness:
 - i. The invasive species would displace native vegetation to the extent the species would alter natural plant communities and soils, which would affect wildlife habitat and biological diversity.
 - ii. The invasive species has the potential to rapidly spread throughout an ecosystem to infest a Wilderness at the landscape scale.
 - iii. The invasive species would alter ecological processes or disturbance processes such as fire.
- b. Use of these methods would prevent the need for larger, more intensive control methods in the future that would further manipulate the biophysical environment.
- c. There are no treatment options outside the Wilderness boundary (FS 2324.04b).
- d. Or the invasive species is a threat to resources outside of Wilderness (FSM 2323.26b).

V. Cumulative Effects Common to All Species

Within the administrative boundary of the Inyo NF, the LADWP owns and manages approximately 20,400 acres of lands primarily around Pumice Valley southwest of Mono Lake and around Lake Crowley. Other private entities own approximately 32,300 acres scattered in mostly smaller parcels. The proposed action would only apply to National Forest System land and does not apply direction or restrict uses on these other lands.

The majority of non-federal managed lands adjacent to the Inyo NF is located in the Owens Valley and major landowners include the LADWP and various private entities. Much of the forest boundary in the Owens Valley has a buffer of Bureau of Land Management lands directly buffering it from these lands.

Under the Endangered Species Act (50 CFR 402.02), cumulative effects are "those effects of future State, Tribal, local, or private actions that are reasonably certain to occur within the action area of the Federal action subject to consultation." Therefore, the cumulative effects analysis in this biological assessment considers the non-federal actions that may affect the plan area, and which may indirectly add to the potential effects to the species resulting from implementing the Proposed Action. The following are the most likely sources of nonfederal activities that may affect analyzed species within the plan area.

Private Land Uses: Private land uses include a wide variety of activities, some of which may also affect species and habitats in the plan area. These activities may include: land conversion from habitat to developments, road development and uses, maintenance and development of power line right-of-ways and facilities, and noise and actions from typical land use activities that create disturbances. Private land actions may also include agriculture, livestock grazing, fire suppression and prescribed burning, vegetation management including timber and vegetation management, rangeland management, and other uses that occur on those lands. Any of these actions may have cumulative effects on the distribution of invasive species within the project area, and likely have contributed to the spread of invasive species in the past. Private lands are difficult to analyze because private landowners do not typically publish their long-term management plans except when required by state or county agencies.

California Department of Forestry and Fire Protection: The California Department of Forestry and Fire reviews and permits timber management on private and State lands, as well as providing for fire suppression and support for prescribed fire on state and private lands. They also support private land actions to address fuels management, remove dead and dying trees, reforest and revegetate lands, and support sustainable forest lands by private landowners. Any of these actions may have cumulative effects on the distribution of invasive species within the project area.

California Department of Fish and Wildlife: The CDFW is responsible for management of fish and wildlife populations on and adjacent to the plan area. They conduct or coordinate surveys and monitoring of federally listed species in collaboration with the Inyo NF. They may also conduct species management activities, such as fish removal, removal of individuals for captive rearing, and reintroductions or translocation within the Inyo NF consistent with relevant direction in the forest plan. As part of its duties, the CDFW stocks fish at select sites within the plan area, however, that fish stocking is coordinated with the national forest and stocking sites have been evaluated to reduce the probability of effects to federally listed species (ICF Jones & Stokes 2010). The CDFW also monitors mortality in Sierra Nevada bighorn sheep and manages mountain lion predation, as needed, in coordination with the USFWS, USDA Wildlife Services, and landowners, including the Inyo NF. Any of these actions increase the risk of transporting invasive weeds by vehicle travel and or on foot and may have cumulative effects on the distribution of invasive species within the project area

Water Management Operation: Public utility companies, primarily the LADWP and Southern California Edison, operate and manage hydroelectric dams, reservoirs, and water conveyances in or adjacent to the plan area. The LADWP operates the Los Angeles Aqueduct that transports water from the Owens Valley to southern California. Those actions are licensed, monitored and regulated by the Federal Energy Regulatory Commission, including maintaining minimum instream flows. The Forest Service has conditioning authority under the Federal Power Act to recommend conditions consistent with forest plan goals, objectives, standards, and guidelines during licensing and re-licensing or projects. Relevant to analyzed species, Federal Energy Regulatory Commission licenses affect the headwaters of Rush Creek and Lee Vining Creek where Yosemite toad occurs. Additional management direction and guidance is provided by the California Department of Water Resources.

Any of these actions increase the risk of transporting invasive weeds by vehicle travel and or on foot and may have cumulative effects on the distribution of invasive species within the project area. Los Angeles Department of Water and Power: The 2010 Owens Valley Land Management Plan (Los Angeles Department of Water and Power and Sciences 2010) describes major management actions for LADWP lands covered by the plan. Goals include: continued water supply to Los Angeles, sustainable land management practices for agriculture and other resource uses such as livestock grazing, continued recreation opportunities on city-owned lands such as fishing, camping, and off-highway vehicle use, improved biodiversity and ecosystem health, and protected and enhanced habitat for threatened and endangered species. LADWP manages for invasive weeds and contributes to preventing infestations from expanding.

Ongoing or future vegetation management and invasive species treatment activities on adjacent public and private lands may have cumulative effects on the distribution of invasive species within the project area, and likely have contributed to the spread of invasive species in the past. Currently, invasive plant treatments are being conducted by BLM and NPS, Inyo-Mono County, Caltrans, California State Parks, and LADWP on adjacent lands or right of ways on the Inyo NF. Implementation of the proposed action is expected to contribute to beneficial cumulative effects, by to improving consistency and coordination with the work being done by others to manage invasive plants within the Inyo NF administrative boundary and on adjacent lands. If new infestations are discovered spreading into the project from adjacent lands, this project has been designed to allow rapid treatment of these new infestations while small, potentially leading to their eradication from Inyo NF lands with less time and resources needed.

VI. Affected Species and Environmental Effects

This section summarizes legal status, habitat requirements, and historic and current occurrences of the federally listed species on the Inyo NF. Species that are not known to occur within the action area are not anticipated to be impacted by proposed actions directly, indirectly or cumulatively and are described briefly in Appendix A - Species Not Considered but are dismissed from further effects analysis in this biological assessment.

Effects Common to Habitats and Species

Activities associated with treating noxious weeds may potentially affect Sierra Nevada yellow-legged frog, mountain yellow-legged frog (DPS), Yosemite toad, Lahontan and Paiute cutthroat trout, Owen’s tui chub, and Sierra Nevada bighorn sheep. This section describes the relevant plan components and project design features that would be implemented within aquatic habitats and how those relate to the potential effects to federally listed aquatic species and their habitats.

Plan Components for Aquatic and Riparian Ecosystems

The Proposed Action includes the Annual Implementation Process that would provide the opportunity to continue to consider current management direction and best management practices that accomplish goals outlined in recovery plans and aquatic and riparian conservation strategy that provides a comprehensive and multi-scale framework for watershed, riparian and stream conservation and management. For example, included among the list of design features are the riparian conservation areas (RCA) that provide guidance for activities implemented up to 300 feet on each side of all perennial streams and 150 feet on each side of seasonal flowing (intermittent and ephemeral) streams, as well as similar distances around lakes, wet meadows, bogs, fens, wetlands, vernal pools, and springs. This direction would be addressed during the Annual Implementation Process. Furthermore, to ensure weed treatment methods benefit these species and their suitable habitat and or critical habitat the following goals set forth in the Inyo Forest Plan will be achieved:

- Inyo, Diversity Goal: The Forest has achieved diversity of plant and animal communities by providing a threshold level of vegetation types and seral stages.
- Inyo Wildlife: Threatened, Endangered, and Sensitive Animal Species: Consider threatened and endangered species as below viability until recovery is achieved. Emphasize the protection and improvement of habitat for threatened or endangered wildlife. Manage for the protection and enhancement of all historically and potentially threatened or endangered species habitat as necessary to meet recovery levels.

Below are selected plan components from the existing forest plan relevant to the Proposed Action. This only includes direction for Aquatic and Riparian Ecosystems specifically referencing or directly related to federally listed species. Other plan components that would indirectly guide projects and are not focused on federally listed species are not included here. Inyo NF plan direction relevant to federally listed species are also found in Appendix B.

Riparian conservation area (RCA)

Riparian conservation area plan components apply to the entire riparian conservation area, as well as the specific riparian and aquatic environments contained within them, such as rivers, streams, meadows, springs and seeps. Riparian and aquatic environments also have additional direction specific to each environment. Widths shown below may be adjusted at the project level (Annual Implementation Process) if site-specific analysis demonstrates a need.

- Perennial Streams: 300 feet on each side of the stream, measured from the bank full edge of the stream
- Seasonally flowing streams (includes intermittent and ephemeral streams): 150 feet on each side of the stream, measured from the bank full edge of the stream
- Streams in Inner Gorge1: top of inner gorge. Inner gorge is defined by stream adjacent slopes greater than 70 percent gradient
- Special Aquatic Features or Perennial Streams with Riparian Conditions extending more than 150 feet from edge of streambank or seasonally flowing streams with riparian conditions extending more than 50 feet from edge of streambank: 300 feet from edge of feature or riparian vegetation, whichever width is greater. Special Aquatic Features include: lakes, wet meadows, bogs, fens, wetlands, vernal pools, and springs.
- Other hydrological or topographic depressions without a defined channel: RCA width and protection measures determined through project level analysis.

Plan components for aquatic and riparian ecosystems provide a broad overarching framework for projects that occur on the forest that aim to achieve desirable aquatic and riparian conditions and drive Project Design Features set forth in this project with a goal of longer-term maintenance of watershed integrity and function. These comprehensive measures help assure sustainable water quality, water temperatures and nutrient supplies by avoiding, minimizing, or mitigating ground disturbances and vegetation changes that could substantially affect aquatic and riparian conditions. Design Features and desired conditions are in addition to the added layer of caution to the already regulated and approved use of these herbicides. These listed below will be carried forwarded in the new forest plan and are essentially identical except that they only include Inyo NF species.

- **SNFPA RCA DC (1):** Water quality meets the goals of the Clean Water Act and Safe Drinking Water Act; it is fishable, swimmable, and suitable for drinking after normal treatment (water quality is further addressed in Hydrology Section of EA).
- **SNFPA RCA DC (2):** Habitat supports viable populations of native and desired non-native plant, invertebrate, and vertebrate riparian and aquatic-dependent species. New introductions of invasive species are prevented. Where invasive species are adversely affecting the viability of native species, the appropriate State and Federal wildlife agencies have reduced impacts to native populations.
- **SNFPA RCA DC (3):** Species composition and structural diversity of plant and animal communities in riparian areas, wetlands, and meadows provide desired habitat conditions and ecological functions.
- **SNFPA RCA DC (4):** The distribution and health of biotic communities in special aquatic habitats (such as springs, seeps, vernal pools, fens, bogs, and marshes) perpetuates their unique functions and biological diversity.
- **SNFPA 96:** Ensure that management activities do not adversely affect water temperatures necessary for local aquatic- and riparian-dependent species assemblages.
- **SNFPA 97:** Limit pesticide applications to cases where project level analysis indicates that pesticide applications are consistent with riparian conservation objectives.
- **SNFPA-98:** Within 500 feet of known occupied sites for ...the mountain yellow-legged frog, design pesticide applications to avoid adverse effects to individuals and their habitats.
- **SNFPA 104:** In stream reaches occupied by, or identified as “essential habitat” in the conservation assessment for, the Lahontan and Paiute cutthroat trout, limit streambank disturbance from livestock to 10 percent of the occupied or “essential habitat” stream reach. (Conservation assessments are described in the record of decision.) Cooperate with State and Federal agencies to develop streambank disturbance standards for threatened, endangered, and sensitive species. Use the regional streambank assessment protocol. Implement corrective action where disturbance limits have been exceeded.

Direct and Indirect Effects Common to All Aquatic Species

This section pertains to the Paiute cutthroat trout, Lahontan cutthroat trout, Owen’s tui chub, mountain yellow-legged frog (DPS), Sierra Nevada yellow-legged frog and Yosemite toad. These species rely entirely or partially on aquatic systems with in the Inyo NF. Figure 2 indicates the currently understanding of known invasive weed locations within 500 feet of aquatic habitat of listed amphibians and fish including lack of weeds within 500 feet of aquatic habitat delineated for listed fish species (= 0 implies zero weeds currently known)

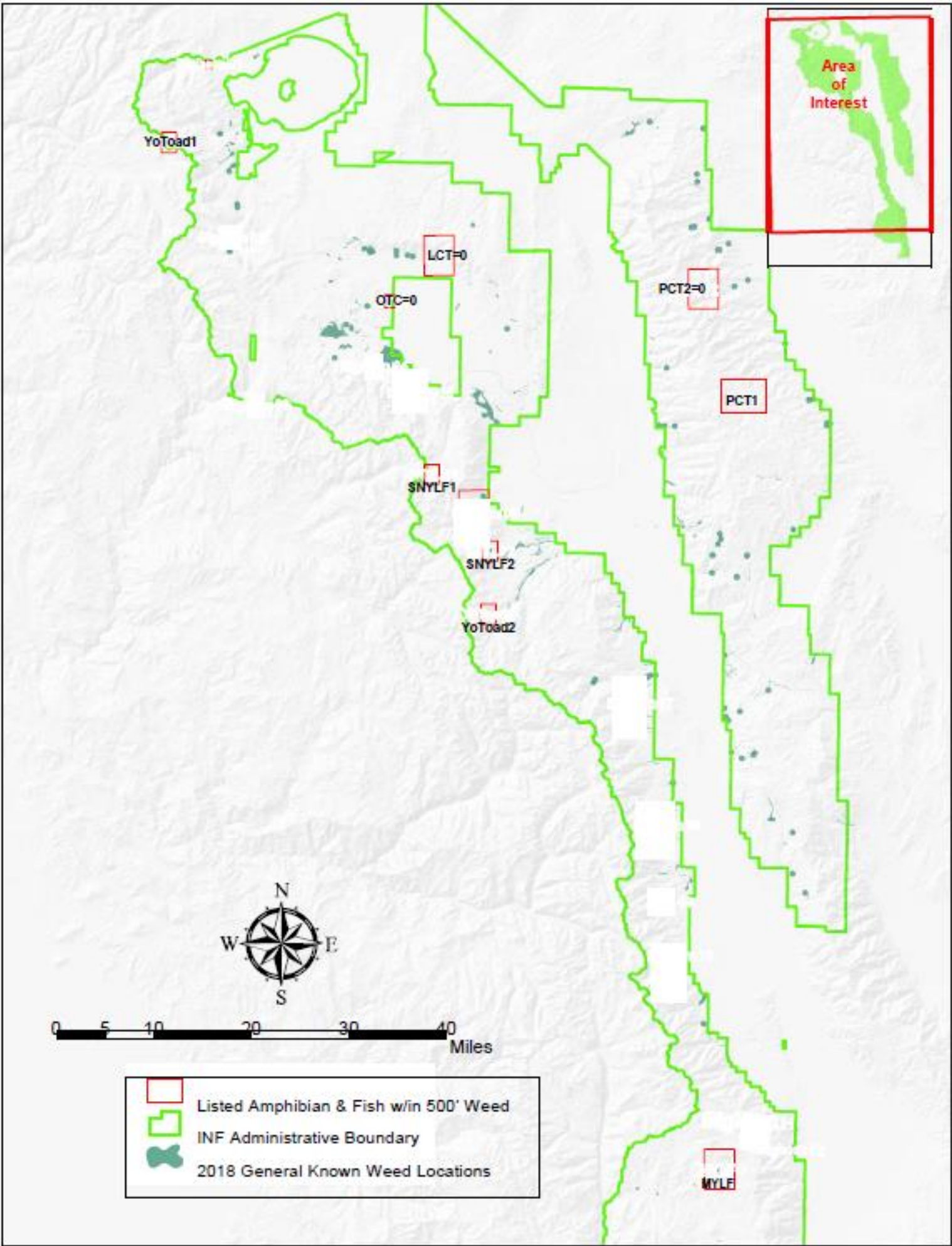


Figure 2 Known Invasive Weed Locations within 500 feet of Aquatic Habitat of Listed Amphibians and Fish

Manual and Mechanical Methods

The direct effects from invasive plant treatment could include disturbance caused by noise, people and vehicles. Human and vehicle presence can cause fish and amphibians to disperse or disrupt behaviors critical to foraging or breeding. Under the proposed action there is a low likelihood that people and vehicles would be disturbing fish located in the streams. Potential effects of invasive plant treatment methods on listed amphibians is largely the presence of weed crews. During implementation to mitigate negative effects to individuals in occupied habitat may require project design features such as, Limited Operating Periods during amphibian breeding seasons and or require a permitted amphibian surveyor on-site.

Cultural Methods (flaming, or tarping)

Flaming using a hand-held propane torch raises the leaf temperature to the point of bursting plant cells and does not require igniting vegetation. Fire personnel would be on site for the use of this method, to provide for human safety and to ensure there is no potential for fire spread from the treated area. This methods would only be considered for herbaceous species. The advantage of this method is that it has very little effect on non-targeted vegetation and no ground disturbance. This methods will have no effect on fish and have acceptable short-term impacts to invasive species that contribute to the riparian flora balanced with long-term benefits of improved ecological function. The project design features include Limited Operating Periods to eliminate sources of disturbance during amphibian breeding seasons or to insure a USFWS permitted amphibian surveyor is on-site during implementation to mitigate negative effects to individuals in occupied habitat according to design features.

Tarping or solarization involves installing a cover (natural or plastic) that raises soil temperature and blocks light which are effective methods for controlling weed populations. Generally used at previously disturbed sights where infestations of weeds become well established (roads, landings, barrow pits). Such disturbed sites can occur within riparian areas as a result of disperse camping, unauthorized road creation, recreational trailing along creeks and meadows. These methods will have no effect on fish and may displace individuals within occupied habitat for amphibians although there are no known instances where use of tarps in wilderness would be used, the Inyo NF would like to be able to consider this option.

Herbicide

The following terminology is used throughout this document to describe relative toxicity of herbicides proposed for use in the Proposed Action.

Threshold of Concern: A level of exposure below which there is a low potential for adverse effects to an organism. Effects on wildlife and other organisms are considered insignificant and discountable when herbicide exposure is below the threshold of concern.

Hazard Quotient (HQ): A "toxicity threshold" was established for each herbicide to indicate the point below which adverse effects would not be expected for a variety of organisms (e.g. people, wildlife, fish). The predicted level of exposure from herbicide use is compared to the toxicity threshold and expressed in terms of a "hazard quotient (HQ)." The Hazard Quotient is the amount of herbicide or additives to which an organism may be exposed over a specified period, divided by that estimated daily exposure level at which no adverse health effects are likely to occur. An HQ less than or equal to one indicates an extremely low level of risk. Toxicity thresholds are based on extrapolated laboratory results and accepted scientific protocols. The probability of harmful effects increases with HQ.

Level of Concern (LOC): An estimate of exposure above which there may be adverse effects; in risk assessments this is defined as a HQ of more than one.

No Observable Adverse Effects Level (NOAEL): Where research has shown no statistically significant effect when compared to animals not exposed to the chemical. Thus hazard quotients (HQ) of less than 1.0 indicate that the exposure poses little reason for concern. Hazard quotients greater than 1.0 pose concern for effects to wildlife.

Exposure Scenario: For each ecological risk assessment, a set of general exposure scenarios based on the low, typical, and maximum label rates of the herbicides are analyzed. For wildlife, exposure scenarios included the animal being directly sprayed; ingestion of contaminated vegetation, prey species, or water; grooming activates; and indirect contact with contaminated vegetation.

The application rate and method influences the amount of herbicide to which an organism may be exposed. Analysis of effects to wildlife from herbicides and the associated surfactants or dyes proposed for use in this project, utilizes risk assessments based upon Human Health and Ecological Risk Assessment reports prepared by Syracuse Environmental Research Associates which utilize the best available science to describe the level of herbicide expected to be introduced, persist, and transport within the forest environment, and to evaluate the likelihood of adverse ecological effects. Only herbicides that have SERA risk assessments and approved Pesticide Use proposals are proposed in this action, FS/SERA risk assessments use peer-reviewed articles from the open scientific literature and current EPA documents. The likelihood that an animal will experience adverse effects from an herbicide depends on: toxicity of the chemical, (2) the amount of chemical to which an animal is exposed, (3) the amount of chemical actually received by the animal (dose), and (4) the inherent sensitivity of the animal to the chemical, all of which are evaluated in FS/SERA risk assessments.

When enough data was available for a particular type of animal, an exposure scenario was developed, and a quantitative estimate of dose received by the animal type in the scenario was calculated as described in the SERA risk assessments. The quantitative estimates of dose were compared to available toxicity data to determine potential adverse impacts. Because of the uncertainty with regard to how accurately a surrogate species may represent other species, the FS/SERA risk assessments use the most sensitive endpoint from the most sensitive species tested as the toxicity index for all wildlife. The estimated dose (from the scenarios) is divided by the “toxicity index” and the result is known as the Hazard Quotient. When the Hazard Quotient is less than 1.0, the dose is less than the toxicity index. Potential effects from doses calculated to be below the toxicity indices are discountable. When a calculated dose was greater than the toxicity index, there is a potential for adverse effects. This very protective approach constitutes a “worst- case” analysis for potential effects of herbicides.

Terrestrial animals might be exposed to any applied herbicide from direct spray, the ingestion of contaminated media (vegetation, prey species, or water), grooming activities, or indirect contact with contaminated vegetation, and these sources of exposure were considered in the risk assessments used for this analysis. As discussed above, the threshold of concern is the “no observable adverse effect level” (NOAEL), where research has shown no statistically significant effect when compared to animals not exposed to the chemical. Thus hazard quotients (HQ) of less than 1.0 indicate that the exposure poses little reason for concern. Hazard quotients greater than 1.0 pose concern for effects to wildlife. Risk assessments show that the highest exposures for terrestrial vertebrates would occur after the consumption of contaminated vegetation or contaminated prey. Other routes of exposure, including direct spray, ~~dermal~~ contact with contaminated vegetation, ingestion of contaminated water, or the consumption of contaminated fish, lead to levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project. Thus, the following discussion found in the Effects to Species sections incorporates risk assessments by species groups and focuses on acute and chronic herbicide exposures resulting from ingestion or exposure to contaminated vegetation or prey, for the herbicides included in the Proposed Action.

The following includes a summary of the SERA toxicity assessments of herbicides included in the Proposed Action. While the assessments do not specifically address effects to the exact species analyzed in this BA, they do address effects relative to fish and amphibians (surrogate species) and therefore are relevant to this analysis.

Herbicides Proposed

Under the Proposed Action, the herbicides proposed are further explained in the Treatment Strategy and Table 6 offers herbicide characteristics and application considerations. No concentration will exceed the maximum label. Table 8 delineates the herbicide application buffers, in feet, around aquatic features. Lastly Appendix D shows a cross walk between treatment strategies by weed species as well as the appropriate targeted herbicides.

Aminopyralid

Results of the aminopyralid risk assessment analysis (SERA 2007) conclude that sensitive fish species exposed to the proposed maximum application rate have an extremely small potential to receive doses that are above the toxicity index. The EPA Pesticide Fact Sheet for aminopyralid (U.S. EPA 2005) states that it has been shown to be practically non-toxic to fish and is not expected to bio-accumulate in fish tissue. This same fact sheet gives a 96 hour LC50 aminopyralid dosage of 100 mg/L (using the EPA uncertainty factor NOEC= 20 mg/L) for rainbow trout and a NOEC of 1.3 mg/L for young fathead minnows (*Pimephales promelas*). Results of the aminopyralid risk assessment analysis (SERA 2007) conclude that sensitive amphibian species exposed to the proposed concentrations have an extremely small potential to receive doses that are above the toxicity index (HQ=0.002). The EPA Pesticide Fact Sheet for aminopyralid (U.S. EPA 2005a) gives a 96-hour LC50 dosage of 95 mg/L (using the EPA uncertainty factor NOEC= 19 mg/L) for northern leopard frog (*Rana pipiens*).

Chlorsulfuron

Results of the chlorsulfuron risk assessment analysis (SERA 2004a) conclude that sensitive fish species exposed to the proposed concentrations have an extremely small potential to receive doses that are above the toxicity index. The EPA Pesticide Fact Sheet for chlorsulfuron (U.S. EPA 2005b) states that it is practically non-toxic to fish on an acute exposure basis. Kegley et al. (2009) found in brown trout (*Salmo trutta*) a 96 hour LC50 dosage of 39 mg/L (using the EPA uncertainty factor NOEC= 7.8 mg/L). The SERA risk assessment for Chlorsulfuron does not include toxicity assessments for amphibians, and no information on toxicity information on amphibians was identified in a review of literature. There is a low risk of concern because project design features and buffers are included in the Proposed Action.

Clethodim

Clethodim acute toxicity to mammals is classified as practically nontoxic. Clethodim is classified as moderately toxic to aquatic invertebrates and slightly to practically non-toxic to fish. The SERA assessments included consideration of accidental acute exposure (from direct spray, or contamination following a spill), non-accidental acute exposures (from contaminated vegetation, water, or consumption of contaminated insects or small mammals), and from chronic/longer term exposures associated with consumption of contaminated vegetation, water, or fish.

Clopyralid

Clopyralid studies on aquatic species, both plants and animals, suggest that clopyralid is relatively non-toxic (SERA 2004a). SERA assessments report extremely low HQs, ranging from 0.000004 (acute exposures in tolerant fish) to 0.004 (sensitive aquatic plants) were calculated and therefore, there is no basis for asserting that effects on nontarget aquatic species are likely. A large series of bioassays and field trials using clopyralid, among other pesticides, were used on a variety of terrestrial invertebrates. Clopyralid studies on birds, bees, spiders, and earthworms that generally support the characterization of clopyralid as relatively non-toxic. In addition, Dabbert et al. (1997) have found that direct spray of bobwhite quail eggs caused no gross effects (i.e., viability, hatchability, body weight) and no effects on immune function (humoral or cell-mediated) in chicks. According to SERA, the current HQ value used is below the level of concern for all exposure scenarios even at the upper limit of plausible doses. Clopyralid in one long-term (8 year) field study has been conducted that indicates no substantial or significant effects on plant species diversity (Rice et al 1997). For chronic exposures, all HQs are below one (0.3) therefore there is no basis for asserting that adverse effects are likely from the application of clopyralid (SERA, 2014).

Fluazifop-P-Butyl

Fluazifop-P-butyl studies based on dietary values, the EPA classifies it as practically nontoxic to mammals, honeybees, and birds. In addition standard reproduction studies were conducted in mallards and quail. In both studies, no statistically significant signs of toxicity or effects on reproduction were noted.

Glyphosate (aquatic formulation)

Glyphosate itself is of moderate toxicity to fish. The 96-hour LC50 of technical grade glyphosate for bluegill sunfish and rainbow trout are 120 mg/L and 86 mg/L, respectively. Fish exposed to 5 mg/L of glyphosate for two weeks were found to have gill damage and liver damage was observed at glyphosate concentrations of 10 mg/L (Neskovic et al. 1996). The technical grade of glyphosate is of moderate toxicity to aquatic species, and the toxicity of different glyphosate formulations can vary considerably.

The surfactant in Roundup® formulations (non-aquatic) can be toxic to fish and larval amphibians. Rodeo® has no surfactant, and is registered for aquatic use. The surfactants in the toxic forms of glyphosate, as reported by SERA are much more toxic than the glyphosate to aquatic organisms, so it is assumed that with the use of an aquatic formulation, a less toxic surfactant may be chosen. Relyea and Jones (2009) found that the proposed application rate of 1.5 mg/L is well within the range of LC50 dosages for amphibian species. Trumbo (2005) found a 96-hour LC50 value for glyphosate without surfactant (i.e. Rodeo®) on larval northern leopard frog (*Rana pipiens*) to be 6.5 mg/L (using the EPA uncertainty factor NOEC= 1.3 mg/L).

Chronic effects resulting from sublethal concentrations of some glyphosate-based herbicides (GBH) have the potential to disrupt larval development according to SERA. . An evaluation of long-term effects, however, is difficult since specific studies on natural amphibian populations or life-cycle tests have not been conducted. Based on the results of some studies, the EPA (U.S. EPA 2012) calculated ecotoxicological endpoints (NOEC, LOEC) for chronic effects of glyphosate-based herbicides on amphibians.

None of the studies addressing acute effects referred to chronic effects. Direct overspray of individuals with some GBH can pose direct health effects while other GBH apparently do not cause any acute effect with recommended application rates.

Imazapyr

SERA reports imazapyr is of low toxicity to fish and invertebrates. The LC50s for rainbow trout, bluegill sunfish, channel catfish, and the water flea (*Daphnia magna*) are all >100 mg/L. As of September 2003, imazapyr (tradename Habitat®) is registered for use in aquatic areas. According to SERA reports, despite its potential mobility, imazapyr has not been reported in water runoff, and found no reports of imazapyr contamination in water. If it enters the water column, imazapyr is photo-degraded by sunlight with an average half-life of two days (Mallipudi et al. 1991).

Triclopyr (BEE & TEA)

Triclopyr is generally used to treat woody species such as tamarisk (*Tamarix ramossissima*) which is a priority species for treatment on the Inyo NF. Application of triclopyr is typically cut stump for woody species, with direct foliar spray sometimes used for small plants. Triclopyr has commonly been used on the Inyo NF to treat tamarisk under the 2007 Invasive Plants EA.

The salt formulation of triclopyr (TEA) is slightly toxic to fish and aquatic invertebrates. The LC50 of the salt formulation for rainbow trout is 552 mg/L and for bluegill sunfish is 891 mg/L. The water-soluble salt is degraded in the water column through photolysis and hydrolysis (McCall & Gavit 1985). Movement of triclopyr through surface and subsurface runoff in areas with minimal rainfall is believed to be negligible (Newton et al. 1990; Stephenson et al. 1990). In southwest Oregon, Norris et al. (1987) found that neither leaching nor long-distance overland water flow contributed significant amounts of the herbicide into a nearby stream, and concluded that the use of triclopyr posed little risk for non-target organisms or downstream water users. Triclopyr BEE is more toxic to aquatic species than triclopyr TEA (SERA 2011b); thus the Proposed Action has more restrictive buffers for BEE. (see Table 8) Only TEA formulation would be used within 50 feet of breeding locations of listed amphibians and fish.

Triclopyr was specifically tested for ability to cause malformations in the frog embryo teratogenesis assay using African clawed frogs (*Xenopus laevis*) (Perkins 2000). *Xenopus* is a highly sensitive assay species for determining the teratogenicity of chemicals (Perkins et al. 2000). No statistically significant increase in abnormalities were seen in any groups exposed to Garlon 3A or Garlon 4 at levels that were not also lethal to the embryos. Consistent with results for other aquatic species, Garlon 3A, containing triclopyr TEA, was 15 times less toxic than Garlon 4, containing triclopyr BEE. Garlon 4 reduced embryo growth at a concentration below the LC50. Perkins et al. (2000) found that the 96-hour LC50 for Garlon 4 was 10 mg acid equivalent (a.e.)/L, and that for Garlon 3A was 159 mg a.e./L. Perkins (2000) calculated that if Garlon 4 was applied at the highest application rate directly to water 15 cm deep (volume not specified), the expected environmental contamination was less than the LC50 and the LC5 by a factor of about four and three, respectively. Berrill et al. (1994) conducted toxicity studies on eggs and tadpoles of leopard frog (*Rana pepiens*), green frog (*Rana clamitans*), and bullfrog (*Rana catesbeiana*) exposed to technical grade triclopyr BEE. The study was conducted in darkness to prevent hydrolysis of triclopyr BEE to triclopyr acid. Exposure of eggs to concentrations up to 4.6 ppm triclopyr a.e. for 48 hours caused no effect on hatching success, timing, malformations, or subsequent avoidance behavior of tadpoles hatched from exposed eggs (Berrill et al. 1994). Tadpoles were more sensitive; all bullfrog and green frog tadpoles exposed to 2.3 and 4.6 ppm triclopyr a.e. died. Leopard frogs were more tolerant and few died, but all were unresponsive to prodding at 2.3 and 4.6 ppm a.e. About half the bullfrog and most green frog tadpoles became unresponsive to prodding when exposed to 1.1 ppm a.e. Surviving tadpoles recovered after exposure was terminated. The Proposed Action does not target aquatic invasive plant species and does not include use of herbicides in water.

Herbicide treatments occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use (Table 6) These herbicides have different formulations than those used in upland plant communities and are considered safe to most aquatic organisms when label directions are followed. Label directions, as well as all laws and regulations governing the use of pesticides, as required by the U.S. Environmental Protection Agency, the California Department of Pesticide Regulation, and Forest Service policy pertaining to pesticide use, would be followed.

Table 6 The Proposed Action Minimum buffers¹ for herbicide application near aquatic features.

	Live Water Present ² in feet			No Live Water Present ³ in feet			Dry Wash/ Ephemeral ⁴
Herbicide (Active Ingredient)	Broadcast Spray	Direct Foliar/ Spot Spray ⁵	Hand Application	Broadcast Spray	Direct Foliar/ Spot Spray ⁵	Hand Application	Direct Foliar/ Hand Application
Aminopyralid	50	25	10	50	10	10	channel edge
Chlorsulfuron	N/A	25	water's edge	N/A	25	channel edge	no buffer
Clethodim	50	25	10	50	25	10	no buffer
Clopyralid	50	50	10	50	25	10	channel edge
Fluazifop-P- Butyl	50	25	10	25	25	10	no buffer
Glyphosate*	25	water's edge	water's edge	25	channel edge	channel edge	no buffer
Imazapyr*	N/A	25	water's edge	N/A	10	channel edge	no buffer
Triclopyr-TEA*	N/A	25	water's edge	N/A	10	channel edge	no buffer
Triclopyr-BEE	N/A	25	10	N/A	10	10	no buffer

¹ Buffers are assumed to be relatively level vegetated areas.
² Perennial and intermittent streams with water present, ponds, lakes, springs, seeps, seasonal wetlands, and wet meadows.
³ Seasonally flowing or intermittent channels that support riparian-dependent vegetation but no water is currently present; dry seasonal wetlands and meadows.
⁴ Dry washes and ephemeral channels that do not support riparian-dependent vegetation.
⁵ Spot spray (pre-emergent treatment) will only occur with aminopyralid or clopyralid.
* Aquatic formulation would be used within 25 feet of live water.

Off-target drift and movement of chemicals through soils can occur when using herbicides. Drift is the movement of any herbicide through the air to areas not intended for treatment. Drift depends on droplet size, wind speed and direction, height above ground of the application, herbicide formulations and ambient temperature.

Movement of chemicals on soil through surface runoff and leaching can be a concern when using herbicides. Surface runoff is when water moves over the surface of a field or treated area that can carry herbicide with it. Leaching occurs when water carries herbicides into and ultimately out of the root zone. The portion lost to leaching depends on soil texture, herbicide solubility, and amount and intensity of rainfall. The greatest potential for herbicide in both runoff and leaching occurs when herbicide comes in contact with the soil surface followed by a precipitation event. During the Annual Implementation Process, project design features listed under Soil and Water Resources ensure herbicide residue on soil surfaces will be minimal and will result in minimal or no measureable impacts to aquatic species. Including but not limited to these design features:

34. State and Regional Water Quality Control Board certified Best Management Practices will be implemented. BMPs applied to all Forest projects are outlined in the Water Quality Management for Forest System Lands in California, BMP handbook and the National Core BMP Technical Guide (USDA Forest Service, 2012).

36. During the Annual Implementation Process, the Forest Watershed Specialist will review the treatment sites to determine if they occur on soils with low permeability and/or high water table. Broadcast and spot spray of aminopyralid and clopyralid would not occur in these areas.

When working with herbicides there is a remote risk of accidental spills, accidental equipment malfunction or other exposure scenarios other than those described above. To limit the potential for herbicide spills impacting threatened and endangered aquatic species, mixing and loading of herbicides would not occur in or near any occupied habitat for these species (PDF #6 & 7). Mixing will occur only on level, disturbed sites off of roadways, such as the interior of landings, and water drafting from aquatic features would not occur (PDF # 6 & 36. Project design feature requires preparation of application to occur outside Riparian Conservation Areas and other sensitive sites buffers (PDF # 6 & 28). Project design features requiring regular inspection and tests of all equipment used for herbicide application would greatly reduce the risk of herbicides spills when working in these sensitive areas (PDF #3). In addition, a small spill containment kit would be carried by herbicide applicators to further limit potential effects in the event of equipment failure (PDF #7).

Designated Wilderness is where the majority of T&E species analyze here occur except for Lahontan cutthroat trout and Owen's tui chub which are entirely outside of wilderness. Designated Wilderness does not preclude use of herbicides. Project design features identified within the Wilderness and Research Natural Areas section do however restrict and or limit the use particularly number 39 and 41.

39. Manual removal of invasive plants will occur within designated or recommended Wilderness areas and RNAs whenever possible. If it is determined that manual treatments will not be effective, Regional Forester approval is required for any herbicide use or biological control within a Wilderness Area (FSM 2320) or RNA (FSM 2150.44).

41. Herbicides would be proposed to treat an invasive species within Wilderness only when:
- The invasive species poses ecosystem-level threats to Wilderness:
 - The invasive species would displace native vegetation to the extent the species would alter natural plant communities and soils, which would affect wildlife habitat and biological diversity.
 - The invasive species has the potential to rapidly spread throughout an ecosystem to infest a Wilderness at the landscape scale.
 - The invasive species would alter ecological processes or disturbance processes such as fire.
 - Use of an herbicide would prevent the need for larger, more intensive control methods in the future that would further manipulate the biophysical environment.
 - There are no treatment options outside the Wilderness boundary (FS 2324.04b).
 - Or the invasive species is a threat to resources outside of Wilderness (FSM 2323.26b).

Observable direct effects from herbicides on amphibians are not expected because they are below the threshold of concern (hazard quotient less than 1) (SERA risk assessments). Herbicides would only be used in instances when hand pulling was determined to not be effective and the threat of infestation of native plant communities was eminent. I Herbicide use incorporates project design features such as monitoring wind speeds and setting low nozzle heights, to reduce the potential for inadvertent drift of herbicide.

According to Human Health and Ecological Risk Assessment reports prepared by Syracuse Environmental Research Associates (SERA), these chemicals proposed for use under the Proposed Action are considered to be low toxicity to birds and mammals including aminopyralid, imazapyr, chlorsulfuron, clethodim, clopyralid, fluazifop-p-butyl, and glyphosate (aquatic formulation), indicate that for both acute and chronic exposures, hazard quotients are below the threshold of concern, 1.0, in all exposure (SERA) and these reports utilize the best available science to describe the level of herbicide expected to be introduced, persist, and transport within plant communities, and to evaluate the likelihood of subsequent adverse ecological effects. These assessments use peer-reviewed articles from the open scientific literature and current EPA documents. The likelihood that an animal will experience adverse effects from an herbicide depends on: (1) toxicity of the chemical, (2) the amount of chemical to which an animal is exposed, (3) the amount of chemical actually received by the animal (dose), and (4) the inherent sensitivity of the animal to the chemical, all of which are evaluated in FS/SERA risk assessments.

Biological Control Agents

Under the Proposed Action, only biological control agents that are permitted for release by the USDA Animal Plant Health Inspection Service (APHIS) and the California Department of Food and Agriculture (CDFA) and Nevada Department of Agriculture (NDA) will be used. Biological control agents that would be used under the proposed action include insects, fungus, and bacteria. Before being permitted by APHIS and CDFA/NDA, these organisms undergo considerable testing and meet other strict criteria prior to their release to ensure they will not pose a threat to non-target species (CDFA 2018). The risk for inadvertent harm to native flora and fauna in the project area is expected to be minimal because by utilizing only federally and state approved insects to control noxious weeds adds another layer of assurance and presumed adherence to state and federal laws including the Endangered Species Act.

Effects to Species

Mountain Yellow-legged frog (Northern DPS) & Sierra Nevada Yellow-legged Frog

The following section outlines the affected environment, threats, and effects analysis for the Mountain yellow-legged frog (Northern DPS) and the Sierra Nevada yellow-legged frog.

The 2014 Mountain Yellow-legged Frog Conservation Assessment (Brown et al. 2014) describes in detail the current habitat, life history, and risk factors for this species and is the source for the following species information unless otherwise noted. Since this biological assessment was summarized from the Conservation Assessment; many of the original supporting literature citations contained in the Conservation Assessment are not repeated here. Much of literature was published prior to the classification split and addresses the species collectively as mountain yellow-legged frog. Because both species remain in the mountain yellow-legged frog complex, much of the data on the species complex is applicable to the following discussion for each species, although species details are noted where possible. Where possible, information relevant to the individual species is presented below; however, much of the information is from more widespread studies of populations and locations on the west side of the Sierra Nevada rather than those populations on the Inyo NF.

Planning watersheds have been identified by CDFW for these two species and are referred to as managements units. There are 18 managements units within lands administered by the Inyo NF, 16 for Sierra Nevada yellow-legged frogs and two for Mountain yellow-legged frogs (California Department of Fish and Wildlife 2016). Coordination between the Inyo NF, CDFW and USFWS on implementation of habitat expansion through non-native fish removal or ceasing stocking in non-self-sustaining fisheries; translocation of frogs; and surveys of fish, frogs and disease surveillance is ongoing. While some fish removal sites result in successful amphibian reproduction and/or recruitment, some have failed, most likely due to heavy infections by disease.

Taxonomy Changes

The mountain yellow-legged frog was once thought to have four evolutionarily distinct lineages from the northern Sierra Nevada, central Sierra Nevada, southern Sierra Nevada, and southern California mountains (Macey et al. 2001). In 2007, the mountain yellow-legged frog in the Sierra Nevada was determined to constitute two species; Sierra Nevada yellow-legged frog (*Rana sierrae*) north of the Kern River watershed and east of the Sierra Nevada crest and mountain yellow-legged frog (*Rana muscosa*) south of the Kern River watershed and west of the Sierra Nevada crest (Vredenburg et al. 2007). The USFWS accepted this taxonomic distinction of the Sierra Nevada populations of *Rana muscosa* in the final rule to list the two species as shown in Figure 3 which depicts the map of the estimated historic range of both species (United States Department of the Interior 2014b).

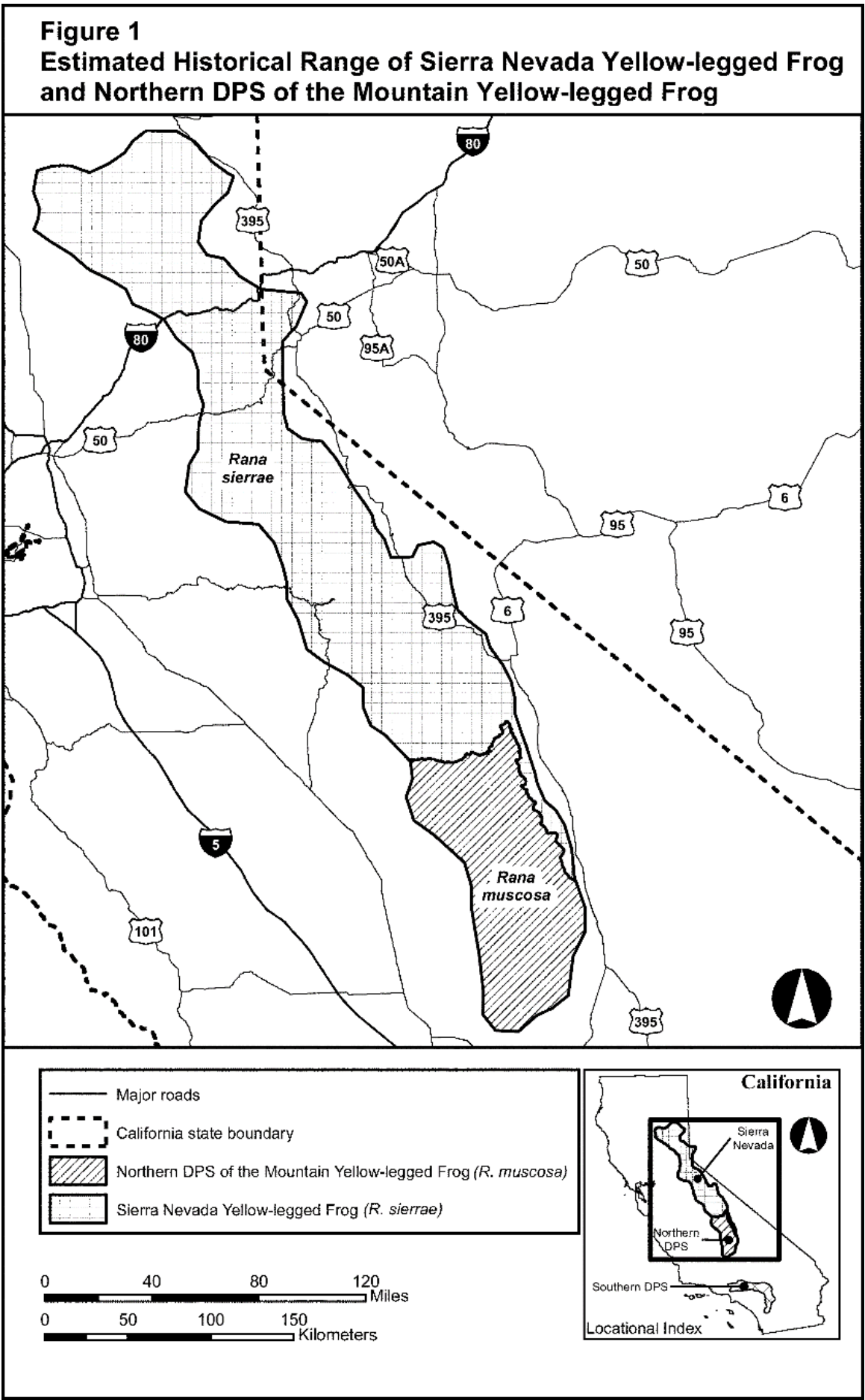


Figure 3 Map of estimated historic range of mountain yellow-legged frog complex

Habitat and Life History (combined for both species)

The Mountain Yellow-legged Frog Conservation Assessment (Brown et al. 2014), USFWS listing rule (United States Department of the Interior 2003a), and USFWS rule designating critical habitat (United States Department of the Interior 2016a) describe key habitat, life history requirements, distribution and threats compiled from a variety of best available science sources. The relevant information is summarized here, generally without the specific source attributions, except where other sources are used or where it may aid in identifying which document contains additional detail.

These frogs are highly aquatic and are found in a variety of habitats including lakes, ponds, marshes, tarns, meadows, and streams. They have been most studied in high alpine lakes in the central and southern parts of the Sierra Nevada, thus less is known about the ecology of these species in non-lake habitats such as streams and meadows. At the lower elevations in the Sierra Nevada, these species are usually associated with rocky stream beds and wet meadows surrounded by coniferous forest. The borders of alpine lakes and montane meadow streams used by yellow-legged frogs are frequently grassy or muddy; this differs from the sandy or rocky shores that are inhabited in lower elevation streams. Adults typically are found sitting on rocks along the shoreline, usually where there is little or no vegetation. These frogs also use stream habitats, especially in the northern part of their range, which vary from those having high gradients with numerous pools, rapids, and small waterfalls, to those with low gradients with slow flows, marshy edges, and sod banks. These frogs may move several hundred meters between breeding, feeding, and overwintering habitats following lake shores and streams, but they will also move short distances across dry land.

Breeding occurs shortly after snowmelt and, in the central and southern Sierra, most commonly in permanent, deep lakes. They breed less commonly in streams and meadows but this is the case for some populations like at Mulkey Meadow where there are several populations in these habitats. Because larvae take two to three years to metamorphose, breeding typically occurs in permanent water. In high elevation habitats, these frogs may spend up to nine months overwintering under ice in lakes and streams. Die-off of adults in shallower lakes was observed in high elevation lakes in a year of exceptional snowpack, but it is unclear if these were due to depletion of dissolved oxygen or were disease related.

Mountain yellow-legged frog, northern Distinct Population Segment and critical habitat

Classification, critical habitat and Recovery Plan

The mountain yellow-legged frog was petitioned for listing under the ESA in 2000 and the USFWS determined that listing was warranted as threatened or endangered for this species in 2003, however, the listing was precluded at the time based on other higher priorities (United States Department of the Interior 2003b). The northern DPS of the mountain yellow-legged frog was recognized as a species and listed as an endangered species in 2014 (United States Department of the Interior 2014b). Final critical habitat was designated in 2016 (United States Department of the Interior 2016a). There are seven designated critical habitat subunits covering approximately 221,498 acres within Fresno, Inyo and Tulare Counties, California. There are portions of three critical habitat subunits covering approximately 12,325 acres occur on the Inyo NF. Unit 4C overlaps with small slivers along the boundary between Sequoia and Kings Canyon National Parks. A Recovery Plan for the species has not been completed.

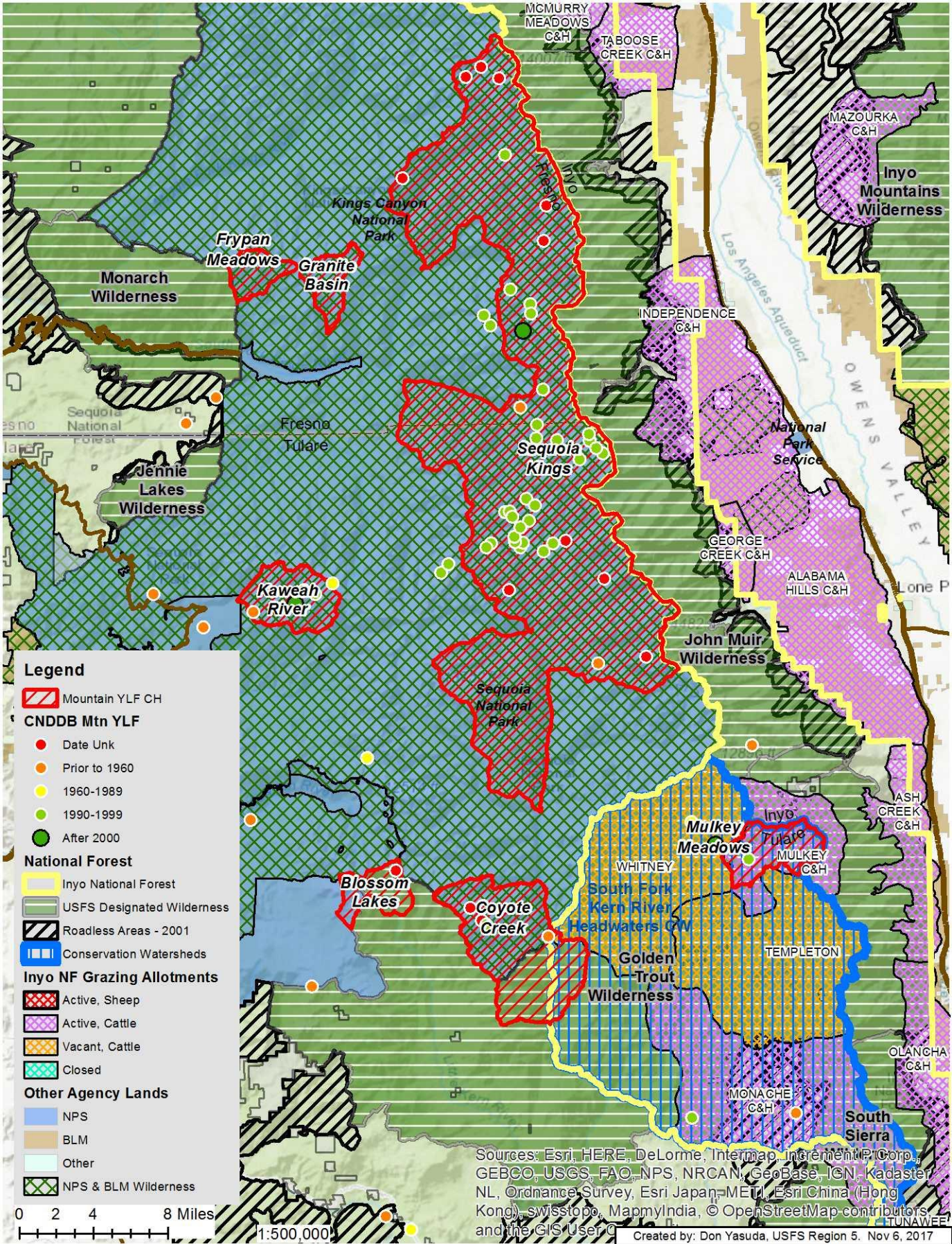


Figure 4 Map of critical habitat subunits for mountain yellow-legged frog, northern DPS

Table 7 Acres of northern DPS Mountain yellow-legged frog critical habitat subunits

Subunit Number	Subunit Name	Total Subunit Acres	Total Subunit Acres, Inyo NF	Total Subunit Acres, Inyo NF Wilderness
4C	Sequoia Kings	166,405	199	189
5B	Coyote Creek	24,141	4,309	4,309
5C	Mulkey Meadows	7,817	7,817	7,817

Mountain yellow-legged frog is also listed by the State of California as an endangered species under the California Endangered Species Act (California Fish and Game Commission 2012). A collaborative inter-agency conservation assessment was completed in 2014 with the USFS, CDFW, National Park Service, and USFWS (Brown et al. 2014). The conservation assessment, which covered both the mountain yellow-legged frog and the Sierra Nevada yellow-legged frog, was developed and reviewed by a mountain yellow-legged frog working group that included representatives from the above mentioned agencies along with species experts and academic institutions such as the University of California, Berkeley and Sierra Nevada Aquatic Research Laboratory (Brown et al. 2014).

Historic and Current Distribution

Mountain yellow-legged frog occur south of the Monarch Divide between the Middle and South Forks of the Kings River and north of the Tehachapi Mountains. The northern DPS in the southern Sierra Nevada and southern California DPS of the mountain yellow-legged frog are currently separated by the Tehachapi Mountains, a distance of about 140 miles (United States Department of the Interior 2014b) (Figure 4 and Table 7).

The Conservation Assessment for Mountain Yellow-legged Frogs provides a detailed summary of the historic and current distribution of the mountain yellow-legged frog complex on the Inyo NF (Brown et al. 2014) (see pages 124-127). Historically this species is known to occur in the Mukley Meadows and Coyote Creek area on the Inyo NF.

The current distributions of the mountain yellow-legged frog is restricted primarily to publicly managed lands at high elevations (United States Department of the Interior 2014b). As of 2016, 2017, and 2018 the CDFW reported that on the Inyo NF, the two mountain yellow-legged frog populations include Mulkey Meadow management unit that has a single robust population and Coyote Flat management unit that is dwindling (2018 detected 2 adults) (California Department of Fish and Wildlife 2017).

CDFW has identified 2 proposed native species restoration projects on the Inyo NF in the Coyote Flat management unit (California Department of Fish and Wildlife 2017). One is fish removal in Hidden Lake in the Golden Trout Wilderness which would also require reintroduction as no mountain yellow-legged frogs currently exist at this location. The second is fish removal near the West Fork Coyote Creek population. Both are only proposed future projects. No native species restoration projects were identified by the CDFW in the Monache management unit, although a possible future project to consider noted was reintroduction into Rocky Basin Lakes.

Population and Habitat Status and Trends

As discussed in the 2014 listing decision (United States Department of the Interior 2014b), “[m]onitoring efforts and research studies have documented substantial declines of mountain yellow-legged frog populations in the Sierra Nevada. The number of extant populations has declined greatly over the last few decades. Remaining populations are patchily scattered throughout the historical range.” In the southern Sierra Nevada, substantial declines overall have occurred; however, modest to relatively large populations of mountain yellow-legged frogs still remain but some large populations have been extirpated in recent years.

The CDFW continues to monitor populations on the Inyo NF (California Department of Fish and Wildlife 2016) and has documented population and habitat status at Mulkey Creek/Bullfrog Meadow and Coyote Flats as of 2018 which are the most southern known populations on INF in the Golden Trout Wilderness and are within critical habitat.

Populations continue to exist in Mulkey Meadow management unit in 2016, 2017, and 2018. Bullfrog Meadow is Bd positive and the population trend is stable or unknown and 2017 surveys resulted in less than 10 detections but in 2018 none were found. The Mulkey population trend was believed to be stable or potentially increasing with more than 100 frogs were seen in 2016. In 2017 quadrant surveys on tads resulted in over 1100 larvae of which 100 were collected and transported to Oakland Zoo (99 survived). This population tested positive for *Bd* in 2013 and appear to be one population persisting in the presence of *Bd* which is one reason for the collection. The habitat is marginal as the stream has fish but one isolated larvae site that restricts fish is persisting. This system at Mulkey is currently being planned to augment and translocate frogs to Rocky Basin Lakes with zoo tadpoles from 2017 and potentially wild adults tentatively planned for fall 2019.

The Coyote Flats management unit, which includes the Baker Creek, Cow Creek, and West Fork Coyote Creek populations was last surveyed in 2018. Population trend in Baker Creek and Cow Creek shows a *Bd* die off occurred in 2008-2009 as surveys between 2010 and 2012 found no frogs and the CDFW considers these sites to be extirpated (California Department of Fish and Wildlife 2017). However, CDFW noted that a hiker reported 2 frogs seen in 2016, which may be repopulation from the West Fork Coyote Creek which still had frogs present in 2012. The West Fork Coyote Creek population was found to be *Bd* negative in 2012, but that was based on few samples so the current *Bd* status is not known. The habitat in West Fork Coyote Creek is limited and marginal. Several stringers between West Fork resulted in detection of one female and one male adults and no tads in 2018.

Sierra Nevada yellow-legged frog and critical habitat

Classification, critical habitat and Recovery Plan

The Sierra Nevada yellow-legged frog was petitioned for listing under the ESA in 2000 and the USFWS determined that listing was warranted as threatened or endangered for this species in 2003, however, the listing was precluded at the time based on other higher priorities (United States Department of the Interior 2003a). The Sierra Nevada yellow-legged frog was recognized as a species and listed as an endangered species in 2014 (United States Department of the Interior 2014b). Final critical habitat was designated in 2016 (United States Department of the Interior 2016a). There are 24 designated critical habitat subunits covering approximately 1,082,147 acres within Lassen, Plumas, Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, Alpine, Tuolumne, Mono, Mariposa, Madera, Fresno, and Inyo Counties, California. There are portions of six critical habitat subunits covering approximately 97,046 acres occur on the Inyo NF (Figure 5, Figure 6, Table 8). A Recovery Plan for the species has not been completed.

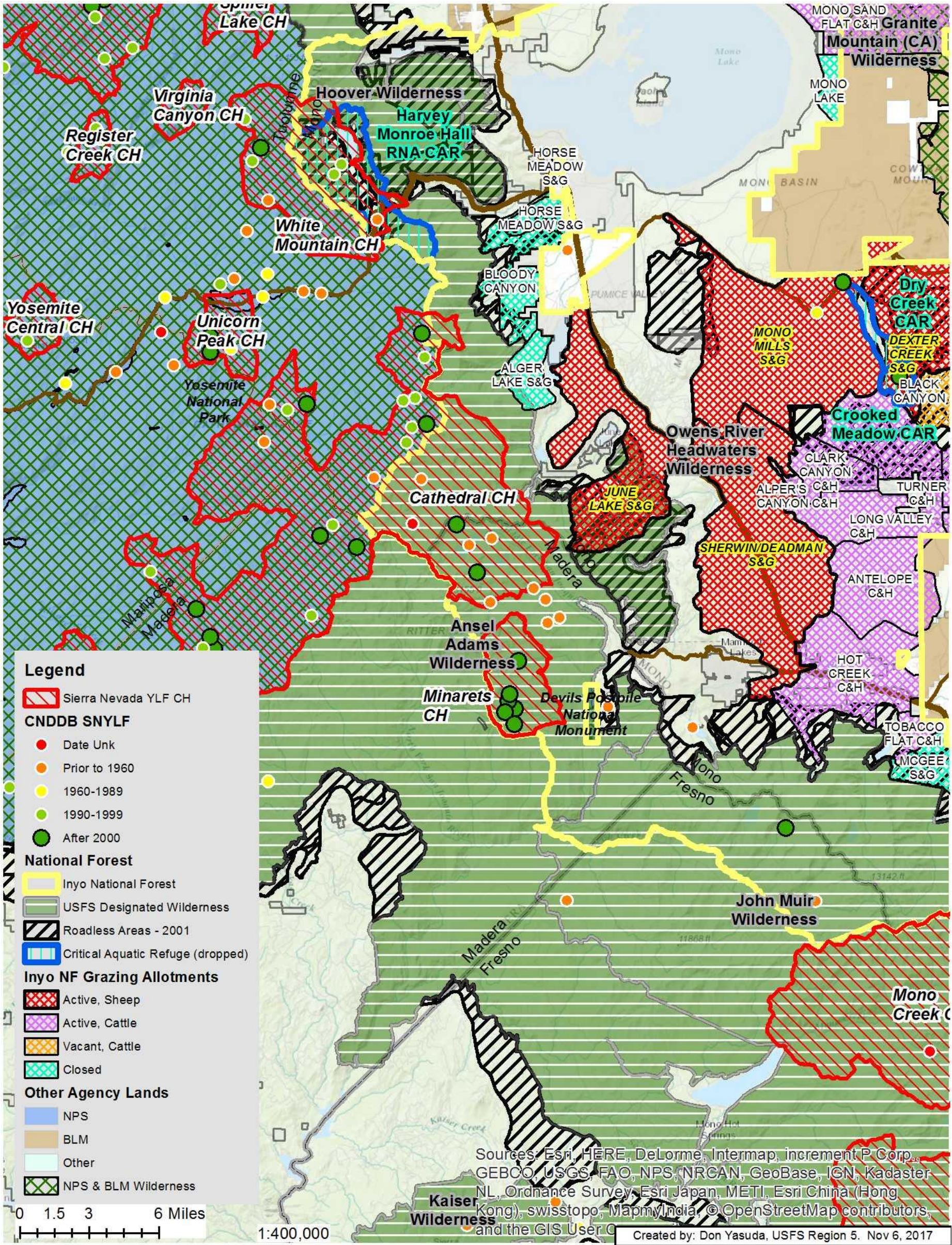


Figure 5 Map of critical habitat units for Sierra Nevada yellow-legged frog

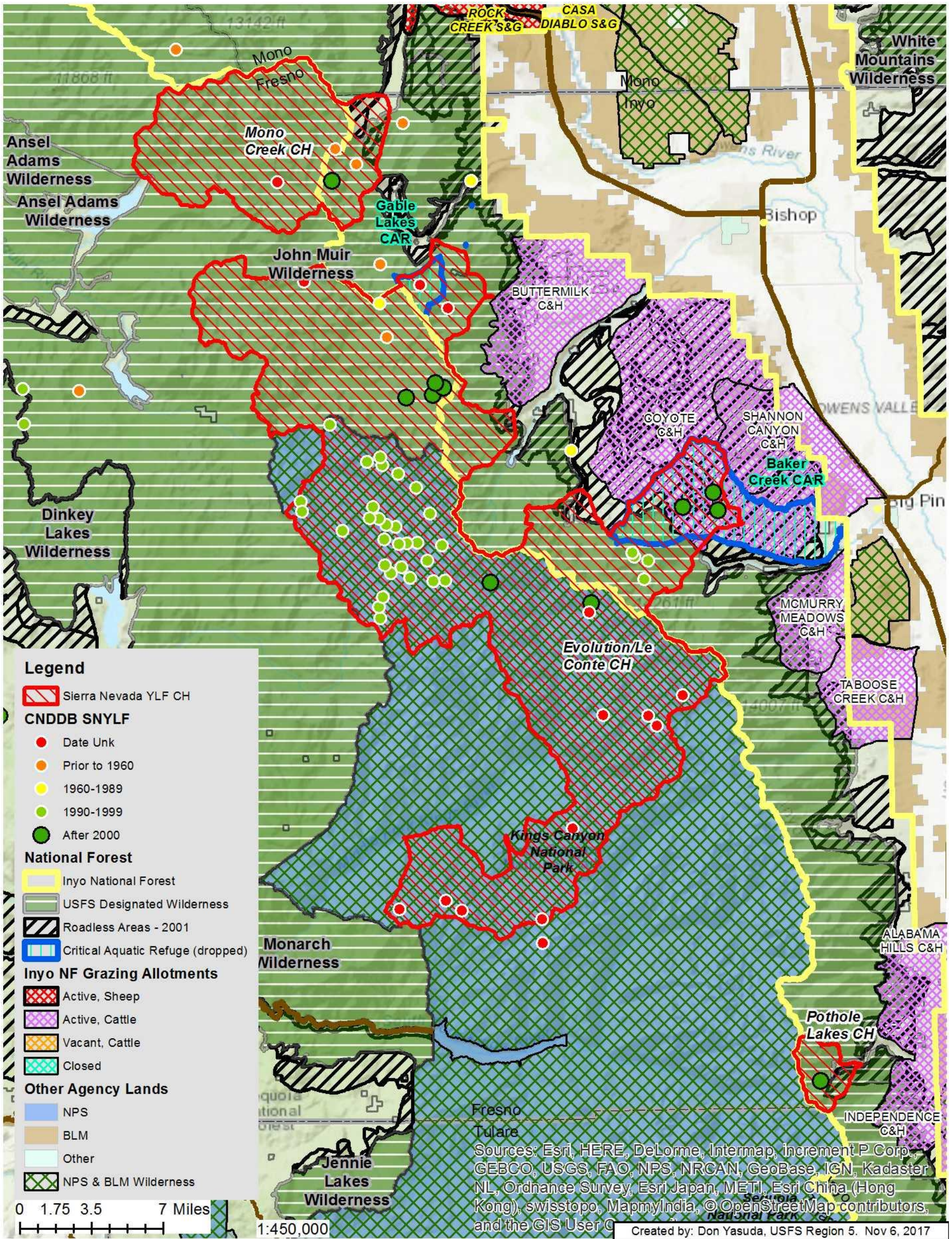


Figure 6 Map of critical habitat units for Sierra Nevada yellow-legged frog

Table 8 Acres of Sierra Nevada yellow-legged frog critical habitat subunits

Subunit Number	Subunit Name	Total Subunit Acres	Total Subunit Acres, Inyo NF	Total Subunit Acres, Inyo NF Wilderness
2M	White Mountain	15,699	8,331	5,171
3B	Cathedral	95,930	26,556	26,458
3C	Minarets	7,621	7,620	7,607
3D	Mono Creek	45,607	8,315	6,527
3E	Evolution/Le Conte	214,952	41,953	31,030
3F	Pothole Lakes	4,274	4,271	4,011

A collaborative inter-agency conservation assessment was completed in 2014 with the USFS, CDFW, National Park Service, and USFWS (Brown et al. 2014). The conservation assessment, which covered both the mountain yellow-legged frog and the Sierra Nevada yellow-legged frog, was developed and reviewed by a mountain yellow-legged frog working group that included representatives from the above mentioned agencies along with species experts and academic institutions such as the University of California, Berkeley and Sierra Nevada Aquatic Research Laboratory (Brown et al. 2014).

Historic and Current Distribution

The USFWS determined that the Sierra Nevada yellow-legged frogs occupy the western Sierra Nevada north of the Monarch Divide (in Fresno County) and the eastern slope of the Sierra Nevada (east of the crest) from Inyo County through Mono County (including the Glass Mountains), to areas north of Lake Tahoe (United States Department of the Interior 2014b). There were historically a few populations in the Glass Mountains disconnected from the rest of the populations in the Sierra Nevada range. However, between 2000 and 2009, these populations were extirpated, likely by *Bd* infection.

The Conservation Assessment for Mountain Yellow-legged Frogs provides a detailed summary of the historic and current distribution of the mountain yellow-legged frog complex on the Inyo NF (Brown et al. 2014) (see pages 124-127). Historically this species is known to occur in most high elevation lakes and streams on the northern portion of the Inyo NF. The historically known populations in the Glass Mountains appears to have been extirpated by the early 2000's and was not identified as providing critical habitat by the USFWS or identified by the CDFW as containing areas being monitored or considered for restoration opportunities.

The CDFW identifies 16 management units on the Inyo NF that are assessed for native species restoration projects. As of 2016, the CDFW (California Department of Fish and Wildlife 2017) reported that on the Inyo NF, Sierra Nevada yellow-legged frog populations exist in 10 of the identified management units and do not occur in six management units: Convict, Hilton-McGee, Goodale, Lone Pine, Cottonwood, and Southern Owens. In that report, CDFW reported on the status of existing native species restoration projects and evaluated the potential for projects within the watersheds of each management unit and that information on restoration potential is provided below.

In the Independence management unit there are no identified additional native species restoration projects. Fish removal has been successful for the Bench/Matlock/Slim Lakes population.

In the Big Pine management unit, one potential fish removal and reintroduction native species project was identified in Big Pine Lake 4. One completed fish removal project in Big Pine Lakes 6 & 7 appeared to be successful but the population is believed to now be extirpated as a result of disease infection.

In the Bishop Creek management unit, eight additional fish removal native species restoration projects were identified: Emerald Lakes, Fishgut Lakes, George Lake, Hurd Lake, Margaret Lake, Schober Hole Lakes, Treasure Lakes 1 & 2, and Wonder Lakes 1, 2 & 3.

In the Rock Creek management unit, two fish removal native species restoration projects were identified: Hidden Lakes and Treasure Lakes. Hidden Lakes also needs investigation of barriers that would keep it fishless.

In the San Joaquin management unit, five fish removal native species restoration projects were identified: Deadhorse Lake, Emily/Vivian Lakes, Holcomb/Noname Lakes, Nydiver Lakes, and Olaine Lake. Four projects have had fish removal and need further analysis and translocation: Castle Lake, Clarice Lake, Lois Lake, and Summit Lake.

In the Rush Creek management unit, three additional fish removal native species restoration projects were identified: Clark Lakes, Koip Crest/Lost Lakes, and Upper Marie Lake.

In addition, CDFW identified native species restoration projects for fish removal in three management units that currently do not contain Sierra Nevada yellow-legged frog populations.

- Mono Lake Management Unit: Conness Lakes, Green Treble/Maul Lakes (Includes Alpine, Bighorn and Finger lakes), Hidden Lake, Ida Lake, and Sardine Lakes.
- Mammoth Management Unit: Sherwin Creek
- Fish Creek Management Unit: Bench Lakes, Cecil and Lee Lakes, and Red and White Lake

One fishless site has been identified for native species restoration projects: Bunny Lake in the Convict management unit. Five management units do not contain populations and were determined to have no native species restoration project opportunities at the present time: Hilton-McGee, Goodale, Lone Pine, Cottonwood, and Southern Owens.

Population and Habitat Status and Trend

The CDFW continues to monitor populations on the Inyo NF (California Department of Fish and Wildlife 2016) and has documented population and habitat status in the Independence, Big Pine, Bishop Creek, Mount Tom, Rock Creek, San Joaquin, and Rush Creek management units as of 2016. A brief summary of the 2016 report information on population status and trend and habitat condition is provided below.

Populations continue to exist in the Independence management unit in the Bench/Matlock/Slim Lakes population in 2016, a successful restoration site. The population trend was believed to be increasing with a large population of over 1,000 frogs. This site was tested in 2013 and 2016 and remains *Bd* negative. The habitat is excellent with three lakes plus a network of habitats.

In the Big Pine management unit, Big Pine Lakes 6 & 7 was a successful native species reintroduction project with fish remove, but it was affected by a *Bd* die off in 2013 and is now in the process of reintroductions with 26 tadpoles removed in 2014 and 4 adults reintroduced in 2016. In 2016, an additional 37 tadpoles were removed for captive rearing in the Oakland Zoo. The habitat is considered excellent with two lakes plus a network of habitats. The population in Sam Mack Meadow was surveyed in 2016 and the population trend shows increases and decreases which might be due to winter die-off events. The population is currently *Bd* negative with testing in 2013 and 2016. The habitat is limited and marginal. The population in 4th Lake Meadow shows a decreasing population trend and currently no frogs in 2016. The site was *Bd* negative, but it was based on few samples and *Bd* status is considered unknown. The habitat is marginal and it was a small population of less than 10 frogs, so causes for the decline are not known but it may be related to drought effects or possibly *Bd*.

In the Bishop Creek management unit, there are two populations, a metapopulation in Treasure Lakes that had fish removal and Wonder Lakes where egg mass translocation was unsuccessful. The Population trend in Treasure Lakes 3 & 4 and at Treasure Lakes 5-7 were increasing as of 2016 and constitute a large meta-population in two slightly separate drainages. These populations were tested in 2013 and 2016 and are *Bd* negative. The habitat is excellent, consisting of five lakes and a network of habitats. The Wonder Lakes native species restoration project of egg mass translocations by the Sierra Nevada Aquatics Research Laboratory was determined to be unsuccessful when last surveyed in 2015 as the population trend is nonexistent with no frogs present. The *Bd* status is unknown but is believed to be positive. The habitat is good to fair but may need additional fish removal.

In the Mount Tom management unit, there are two populations, Gable Lakes has had fish removal completed and Horton Creek is in the process of having fish removed. Gable Lakes has a large population of over 1,000 frogs and trend was increasing in 2016. Testing in 2013 and 2016 was *Bd* negative. The habitat is excellent consisting of four lakes and a network of habitats. The Horton Creek population has ongoing fish removal from Horton Lakes 3 and 4 which will likely need reintroduction because the small downstream population has a decreasing trend and distance and terrain likely preclude natural population expansion. The site was *Bd* negative in 2013 and 2016 testing. Outside of the two lakes with fish removal, additional habitat is marginal with one small shallow pond and two stream sites with fish and no fish removal opportunities.

In the Rock Creek management unit, there is one current population and one failed population on the Inyo NF and one captive rearing site population on private land. The Birch Creek population has a stable trend with 88 and 90 egg masses recorded in 2014 and 2015 respectively. The site is *Bd* negative with testing in 2013 and 2016 and is used as a source population for larvae translocations. The habitat is limited and marginal because the springs are weak and the pools are silting in. The Eastern Brook Lakes population had unsuccessful reintroductions of larvae and adult frogs. Although there are two fishless lakes and a network of habitats, the site is *Bd* positive and was unoccupied in the last 2016 survey. Larvae from the Birch Creek population were used to establish the Swall Meadows captive rearing site on private land. This population was found to be stable or increasing in 2016 and may be at carrying capacity. It is *Bd* negative from 2013 and 2016 testing. The habitat is a recycling network of ponds.

In the San Joaquin management unit there are 11 populations that all are *Bd* positive and are considered persistent with *Bd*. The Gertrude Lake population, including Anona, Ashley and Holcomb Lakes, was surveyed in 2016 and found to have a decreasing population trend. Habitat is limited in Gertrude Lake, but other options are Anona, Ashley, and Holcomb Lakes, which all contain fish. The Minaret Meadow population is very small with less than 10 frogs and is also decreasing when last surveyed in 2015. The *Bd* status is assumed positive but there were few samples. Habitat is marginal and limited with shallow sites that are drought affected. The Garnet Lake Ponds population is also very small but the population trend was stable in 2015. Habitat is limited consisting of two large shallow lakes with one breeding site. The Banner Lakes population is a medium population that had a stable population trend in 2016 and it is used as a source population for larvae translocations. The habitat is good with two deep lakes with a warm breeding pond. Yosemite toads are also present. The Garnet Ridge population showed a decreasing trend in 2016 with low numbers of adults seen and the numbers of larvae decreasing. This site is used as a source population for larvae translocations but habitat is limited with one breeding lake that is heavily affected with *Bd*. The Emerald Lake population is a successful native species restoration project where larvae were translocated and in 2016 the population trend is stable, but has low numbers. Although the habitat is good, the breeding pond is affected by drought. The Badger Lakes population is an active native species restoration project where 6 years of larvae translocations has occurred, but as of 2016 the population trend is nonexistent and there are no frogs present and the translocations have stopped. The habitat has two deep lakes and a network of shallow ponds.

In the Rush Creek management unit there are three populations that all are *Bd* positive and are considered persistent with *Bd*. The Island Pass population had a stable, but variable population trend in 2016 and it is used as a source population for larvae translocations. The habitat is good with two breeding lakes and a large network of habitats. The Rodgers Lakes population was small but with a stable population trend in 2015. The habitat is limited with shallow sites. The Donahue Ponds population was stable with two separate distinct habitat types of stream and ponds. The habitat is excellent with a varied network of habitats.

Critical Habitat Primary Constituent Elements (both species)

The USFWS (United States Department of the Interior 2016a) determined that the primary constituent elements specific to the Sierra Nevada yellow-legged frog and the northern DPS of the mountain yellow-legged frog are:

- 1) *Aquatic habitat for breeding and rearing*. Habitat that consists of permanent water bodies, or those that are either hydrologically connected with, or close to, permanent water bodies, including, but not limited to, lakes, streams, rivers, tarns, perennial creeks (or permanent plunge pools within intermittent creeks), pools (such as a body of impounded water contained above a natural dam), and other forms of aquatic habitat. This habitat must:
 - a) For lakes, be of sufficient depth not to freeze solid (to the bottom) during the winter.
 - b) Maintain a natural flow pattern, including periodic flooding, and have functional community dynamics in order to provide sufficient productivity and a prey base to support the growth and development of rearing tadpoles and metamorphs.
 - c) Be free of introduced predators.
 - d) Maintain water during the entire tadpole growth phase and have suitable bank and pool habitats with appropriate thermal characteristics, refugia, and food resources.
- 2) *Aquatic nonbreeding habitat (including overwintering habitat)*. Habitat may contain the same characteristics as aquatic breeding and rearing habitat (often at the same locale), and may include lakes, ponds, tarns, streams, rivers, creeks, plunge pools within intermittent creeks, seeps, and springs that may not hold water long enough for the species to complete its aquatic life cycle. This habitat provides for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult mountain yellow-legged frogs. Aquatic nonbreeding habitat contains suitable bank and pool habitats with appropriate thermal characteristics, refugia, food resources, overwintering refugia, and movement corridors.
- 3) *Upland areas*. Upland areas adjacent to or surrounding breeding and nonbreeding aquatic habitat that provide area for feeding and movement by mountain yellow-legged frogs. Habitats are up to 82 feet from streambanks, shorelines or between adjacent proximate water bodies, or mesic habitats such as lake or meadow systems. Upland areas also include catchments adjacent to and surrounding both breeding and nonbreeding aquatic habitat that provide for the natural hydrologic regime (water quantity) of aquatic habitats. These upland areas should also allow for the maintenance of sufficient water quality to provide for the various life stages of the frog and its prey base.

Threats (both species)

The USFWS (United States Department of the Interior 2016a) identified the following threats: the persistence of introduced trout populations in essential habitat; the risks related to the spread of pathogens; the effects from water withdrawals and diversions; impacts associated with timber harvest and fuels reduction activities; impacts associated with inappropriate livestock grazing; and intensive use by recreationists, including pack stock camping and grazing.

The 2014 Conservation Assessment provides a detailed examination of risks to the mountain yellow-legged frog complex throughout its range (Brown et al. 2014). It identified 13 risk factors relevant to land and resource management. Three are considered focal risk factors that are linked to declines: Introduced fish and other predators, disease, and habitat loss and fragmentation. Ten additional risk factors are within the authority of the Forest Service to address but are not currently linked to declines: fire suppression activities, habitat restoration, livestock grazing, locally applied pesticides, mining, recreational activities (including pack stock), research activities, roads, vegetation and fuels management, and water development and diversion. Of these, the most relevant to consider on the Inyo NF are: fire suppression activities, habitat restoration, livestock grazing, and recreational activities (including pack stock).

Introduced fish and other predators.

Predation by introduced fish, especially non-native salmonids (rainbow trout, golden trout, brook trout, and brown trout), is a recognized cause of decline of mountain yellow-legged frogs in the Sierra Nevada. In 2010, the CDFW and USFWS analyzed and adopted direction for the management of the state's hatchery and stocking program (ICF Jones & Stokes 2010). That action adopted a process for addressing

potentially significant stocking effects on sensitive, native, and legally protected fish and wildlife species that prohibits fish stocking where it conflicts with conservation goals of federal recovery plans or within federally designated critical habitat for considered species, which include the currently listed Sierran amphibian species. Thus, fish stocking no longer occurs within the areas occupied by these species. Although continued fish stocking has ended, many trout populations are self-sustaining and are likely to continue to persist unless purposely removed. Study of areas with fish removal has shown success at improving yellow-legged frog populations. Some fish removal in native species restoration projects has been implemented by the CDFW within the Inyo NF as noted in the Historic and Current Distribution sections above. The CDFW has identified additional opportunities for fish removal and subsequent reintroduction of yellow-legged frogs as noted in the Historic and Current Distribution sections above.

Disease

The Conservation Assessment includes a discussion of disease risk and concludes that disease, particularly chytridiomycosis, is a serious contributor to mountain yellow-legged frog declines. It documents that major population crashes have resulted from chytridiomycosis infections, and the amphibian chytrid fungus, *Bd*, has been confirmed as a widespread threat to mountain yellow-legged frog persistence in the Sierra Nevada. Other pathogens may be contributors to declines, but their status is unknown. Of the 27 populations on Inyo NF ten of the 27 are *Bd* negative (California Department of Fish and Wildlife 2016). Populations that are *Bd* positive result in die offs or are persisting in the presence of *Bd* which is being investigated by researchers.

The disease risk to mountain yellow-legged frog populations is considered focal because current populations are small and isolated, increasing the potential for local extirpations which could further isolate remaining populations, increasing the likelihood of extinction for the mountain yellow-legged frog in the Sierra Nevada. However, the Conservation Assessment also recognized that little can be done to manage for this risk factor unless vectors of these pathogens over which management can influence are identified. Despite this uncertainty, the Conservation Assessment suggests that actions should be taken to reduce other environmental stressors that may facilitate or augment the effects of these pathogens; recognizing that interactive effects between pathogens and other stressors remain largely unstudied. In particular, too few data exist to inform management about which stressors interact with disease and how they might be effectively reduced to prevent the onset of disease and alleviate its effects.

The introduction and spread of *Bd* effects are much more challenging to overcome, because this pathogen is highly virulent for Sierra amphibians and once it has arrived in a population it cannot be eradicated. As such, it is hoped that although most populations are extirpated following *Bd* arrival some will persist and over time become less susceptible to *Bd* infection (“persistent” populations). The Inyo NF has cooperated with state and private research efforts to have an emergency response plan to prevent the extirpation of populations following disease-caused mass-mortality events that allows intervention to conduct antifungal treatments in the field and capture animals for rearing at zoos to increase frog survival and the probability of long-term population persistence. A temporary special-use permit from 2017 to 2021 was issued to Sierra Nevada Aquatic Research Laboratory, the lead research lab for continued recovery actions on the mountain yellow-legged frog across both the Inyo and Sierra National Forests.

Habitat loss and fragmentation

Direct habitat loss is not a relevant factor for the Inyo NF given the extent of habitat and number of populations located in designated wilderness areas and in remote areas. However, the practical effects of other risk factors could reduce populations which could result in increased fragmentation of populations. Further isolation of existing populations may be a high risk to the species. To address this, species conservation approaches should protect existing populations and also provide mechanisms for re-establishing mountain yellow-legged frogs in nearby areas.

Fire suppression activities

In the parts of the species’ range that occurs in wilderness areas, intensive fire suppression activities are rarely conducted and mechanized equipment generally is not used. In these remote areas, minimum-impact fire suppression techniques are used and may represent the best alternative to protecting mountain yellow-legged frogs and their habitat.

Concerns regarding the effects of aerial application of fire retardant on aquatic systems and federally listed species were addressed in the Forest Service decision that directs aerial retardant tanker pilots to avoid application of retardant or foam within 300 feet of waterways (United States Department of Agriculture 2011). A “waterway” is considered to be any body of water including lakes, rivers, streams and ponds irrespective of whether they contain aquatic life. Although the initial analysis was completed prior to these species becoming federally listed, the analysis is being updated (P. Krueger, pers. comm.) Areas to avoid for the mountain yellow-legged frog, Sierra Nevada yellow-legged frog, and Yosemite toad are currently included in aerial retardant avoidance maps.

Habitat restoration

Restoration is an activity that is anticipated to increase. Fish removal restoration in multiple experiments has successfully led to increased mountain yellow-legged frog populations. Examples of habitat restoration by removing non-native fish have occurred on the Inyo NF. Starting in 1999, brook and rainbow trout were removed from Big Pine Lakes #6 and #7 and by 2013 Sierra Nevada yellow-legged frog populations had increased demonstrating the potential of habitat restoration by fish removal (Erdman 2013). Unfortunately, in 2013, a virulent *Bd* infection severely affected the adults in this population and it is believed to be extirpated. Restoration of fish-free habitat would greatly contribute to the conservation of this species. There currently remains several “native species restoration areas” identified within the 18 Management Units on Inyo NF that are in coordination with CDFW (California Department of Fish and Wildlife 2017).

Other risk factors

Locally applied pesticides, grazing, mining, research activities, and water development and diversion are other risk factors evaluated in the Conservation Assessment. Since most occurrences are within wilderness, pesticide application, mining, and water development and diversion would generally not occur. Activities affecting federally listed species require permits from the CDFW and USFWS and may require special use permits from the USFS if they involve ground disturbing activities or affect other public uses and resources.

Analysis of Effects

Current Invasive Plant locations within Mountain Yellow-legged Frog Habitat

Outside critical habitat on the Kern Plateau and Golden Trout Wilderness exists the greatest amount of known weed detections in unoccupied habitat for a total of 171 acres. This represents 119 weed locations of 15 invasive species. Only one weed species is categorized as Treatment Strategy 1 (eradicate), the perennial pepperweed found at three locations between Jordan Hot Springs and Soda Flat. Removal of this species is ongoing by hand treatments. These three locations occur along creeks that feed into the Kern River and pose a high risk for expansions to other landscape. This project offers 9 additional treatment opportunities aimed at obtaining the greatest opportunity for success to eradicate these sites. There are no known frog detections at these three locations and therefore will not affect individuals however eradicating three sights will temporally degrade about 1.5 acres of potential habitat but is expected to quickly recover with native perennials. The remainder of the 119 weed locations fall within Treatment 3 (contain) that has four species and Treatment 4 (limit or no treatment) that accounts for 8 species. Overall the incidence of weed locations in unoccupied habitat prioritized for treatment is very low but Infestations in special status areas, such as listed species habitat, can be elevated in priority for treatment..

Within critical habitat there are currently one mapped weed infestation, totaling approximately 193 acres, within 500 feet of aquatic habitat for Mountain Yellow-legged Frog (Table 9 and Figure 7). There are portions of six critical habitat subunits covering approximately 97,046 acres occur on the Inyo NF and this single weed site accounts for 0.2%.

The weed species is common dandelion and is Treatment Strategies 4, to limit or no treatment (Appendix D). Infestations in special status areas, such as listed species habitat, can be elevated in priority for treatment. This infestation is within CH, approximately 2 miles downstream from occupied Mulkey frog population and within occupied California golden trout habitat. As indicated in Appendix D common dandelion treatments recommended include these options; hand pull, dig, cut, and glyphosate. Treating this site for frog habitat improvement would consider several factors including the rate of spread, potential for ecological negatively impact native flora species, and among other things the potential for irradiation success. This dandelion infestation is mapped as a single polygon which largely inflates treatment and overestimates actual acres. Common dandelion can be sparsely present in a single area; the 193 acres represents this larger “zone” of occurrence. It is highly unlikely that this site will receive treatment or get elevated priority due to the low likelihood for success of irradiation. That said, monitoring of this existing site could result in some treatments to prevent further spread.

Table 9 Acres of Northern DPS Mountain yellow-legged frog critical habitat subunits

Subunit Number	Subunit Name	Total Subunit Acres	Total Subunit Acres, Inyo NF	Total Subunit Acres, Inyo NF Wilderness	Weed Acres	Weed Species	Treatment Priority
4C	Sequoia Kings	166,405	199	189	0	N/A	N/A
5B	Coyote Creek	24,141	4,309	4,309	0	N/A	N/A
5C	Mulkey Meadows	7,817	7,817	7,817	<193 (buffer zone)	Common Dandelion	#4 Limited/No Treatment

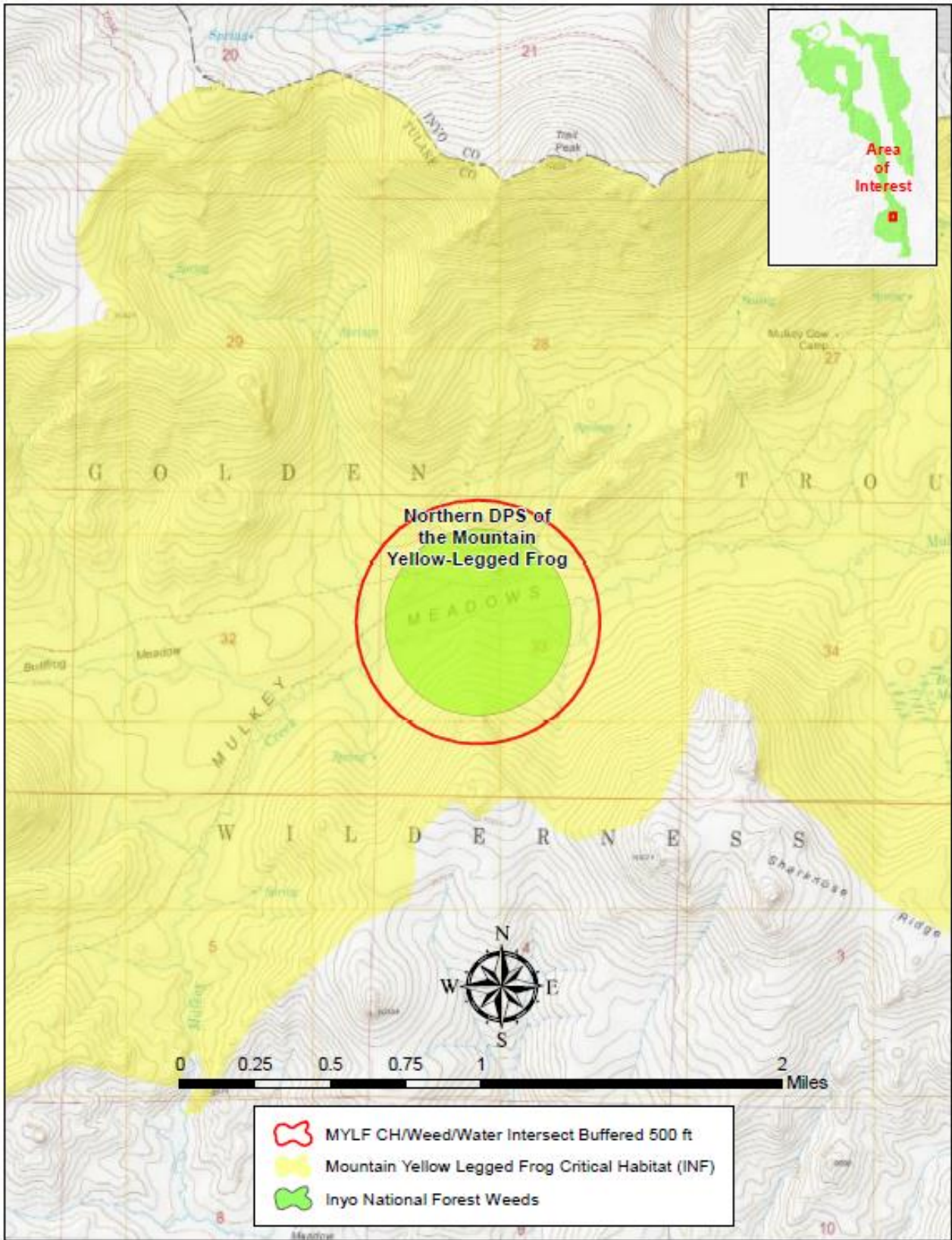


Figure 7 Northern DPS Mountain Yellow-legged Frog and Known Weed Locations

Current Invasive Plant locations within Sierra Yellow-legged Frog Habitat

Outside of critical habitat, in occupied breeding habitat there are currently one mapped weed infestation, totaling about 4.5 acres within a 20 acre meadow system. The Birch Creek population part of the Rock Creek management unit in Mono County has occupied breeding habitat at Witcher Meadow (referred to as Birch Creek population by CDFW) where an invasive weed population of yellow salsify (*Tagopogon dubius*) encompasses less than 4.5 acres. Yellow salsify is treatment strategy 4 which is to “limit or not treat” and can be mitigated by the following tactics; handpull, dig, cut, graze, glyphosate. This meadow system is about 20 acres and breeding is limited to just a few small pools with Birch creek flowing in the middle. Due to past wildfires, a road that is above the steep canyon wall, and a narrow outlet this 20 acre meadow system acts as a “catch basin” that continues to fill in with woody debris, rock, and sediment resulting in thick willows and limited wet meadows with few, isolated, small breeding pools, but the population persists. This weed species is generally not associated with wet soils rather dry, disturbed areas. It is likely this weed is associated to disturbed areas in Witcher Meadow possibly from past wildfires, debris flows, sluffing of adjacent cliff, old access roads, and potentially an indicator of a system that is beginning to dry out. Maintaining suitable breeding habitat at Witcher meadow is an ongoing discussion with CDFW and INF. Consideration for any future meadow restoration would include treatment of this weed species. Because Witcher meadow is occupied frog habitat and this weed site is within 500’ the following project design features would apply to avoid adverse effects:

- 19. Immediately prior to any treatment activities, a Forest Service biologist who is trained in identifying and handling rare amphibians will survey the area for SNYLF, MYLF and YT. If individuals are found they will be relocated to a safe location that is nearby but out of potential harm’s way from treatment activities. In most cases this will be less than 100 feet from the original location of the amphibian.
- 20. Chemical treatments within 50 feet of active breeding locations for SNYLF, MYLF and YT would be limited to direct foliar, spot spray, or hand application of glyphosate, imazapyr, or triclopyr-TEA until after metamorphosis has occurred. Metamorphosis typically occurs around July 31st and will be confirmed with a site-specific survey prior to treatment.

2018 annual CDFW survey at Witcher meadow (Birch Creek) report the following:

- Birch Creek (3 sites) *(Surveyed 2018).
- Population trend is stable (2014: 88 egg masses; 2015: 90 egg masses; 2016: 92 egg masses; 2017: 95 egg masses; 2018: 123 egg masses).
 - Bd negative, swabbed in 2013, 2016, 2017 & 2018. Expected to become positive in future.
 - Habitat is limited and marginal. Springs weak and pools silting in.

Outside of critical habitat, in unoccupied habitat there are currently two general areas with mapped weed infestation associated with a highly disturbed site as a result of mining, tourism and recreation. The weed locations are low quality habitat and removing noxious weeds will not further degrade the habitat, ideally it may improve it with the conversion of native perennials.

Pine Creek Tungsten Mill has several detections of different invasive species totaling about 20 acres adjacent to Pine Creek and mill ponds. Fivehorn smotherweed (*Bassia hyssopifolia*) occupies 7.8 acres and common mullein (*Verbascum Thapsus*) occupies .5 acres and herb Sophia (*Descurainia Sophia*) occupies 0.06 acres

Saw Mill Meadows contains common dandelion (*Taraxacum officinale*) totaling about 17 acres of unoccupied habitat.

Within critical habitat there are currently two mapped weed infestations, totaling approximately 8.67 acres, within 500 feet of an aquatic habitat for Sierra Nevada yellow-legged frog (Table 10). There are portions of six critical habitat subunits covering approximately 97,046 acres occur on the Inyo NF and these two weed site accounts for 0.009% (Table 10, Figure 8, Figure 9).

Table 10 Acres of Sierra Nevada yellow-legged frog critical habitat subunits

Subunit Number	Subunit Name	Total Subunit Acres	Total Subunit Acres, Inyo NF	Total Subunit Acres, Inyo NF Wilderness	Weed Acres	Weed Species	Treatment Method
2M	White Mountain	15,699	8,331	5,171	0	N/A	N/A
3B	Cathedral	95,930	26,556	26,458	0	N/A	N/A
3C	Minarets	7,621	7,620	7,607	0	N/A	N/A
3D	Mono Creek	45,607	8,315	6,527	<1.37 (buffer zone)	Common Dandelion	#3 Contain
3E	Evolution/Le Conte	214,952	41,953	31,030	<7.3 (buffer zone)	Cheatgrass	#4 Limited/No Treatment
3F	Pothole Lakes	4,274	4,271	4,011	0	N/A	N/A

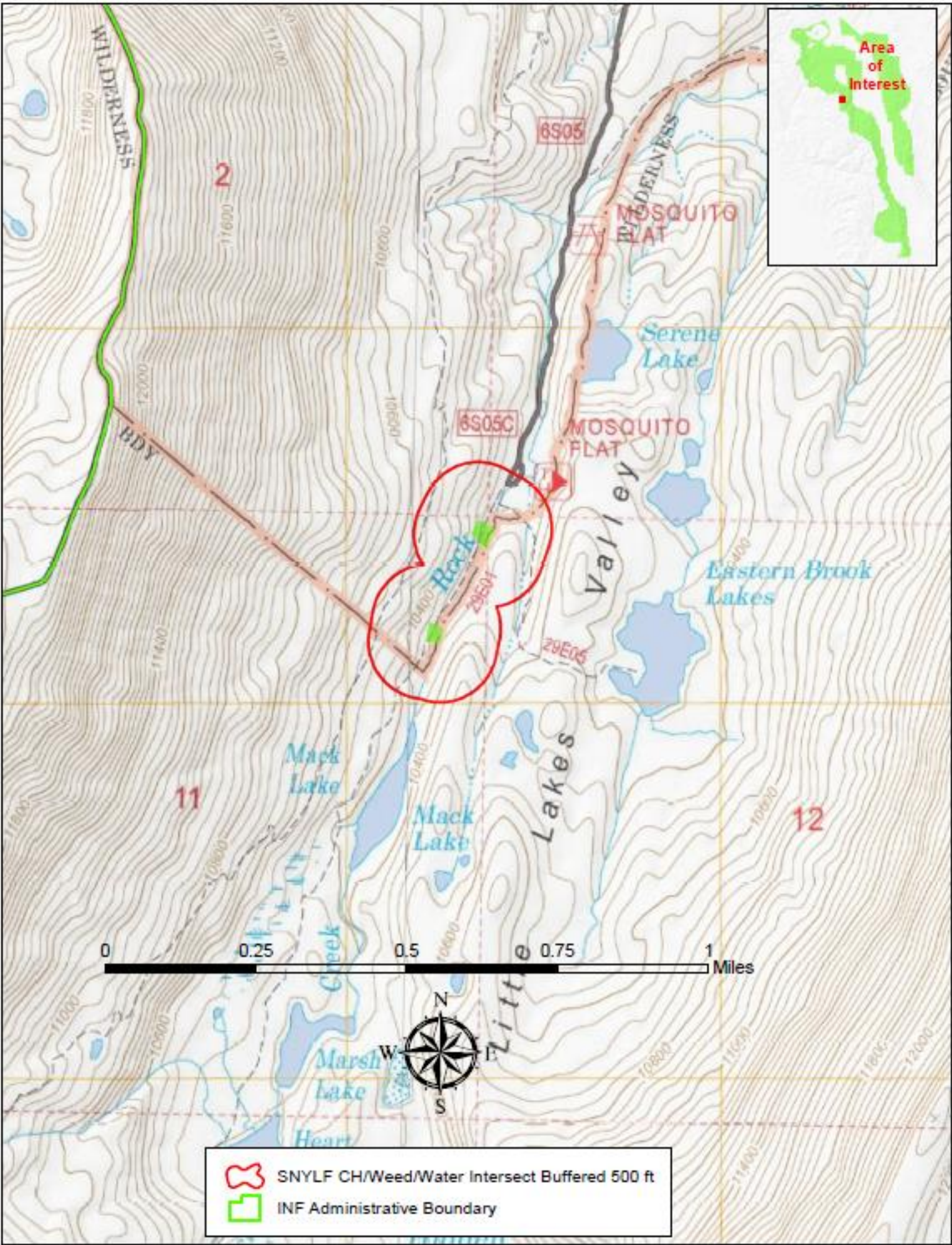


Figure 8 Sierra Nevada yellow-legged frog Mono Creek CH & Weed Locations

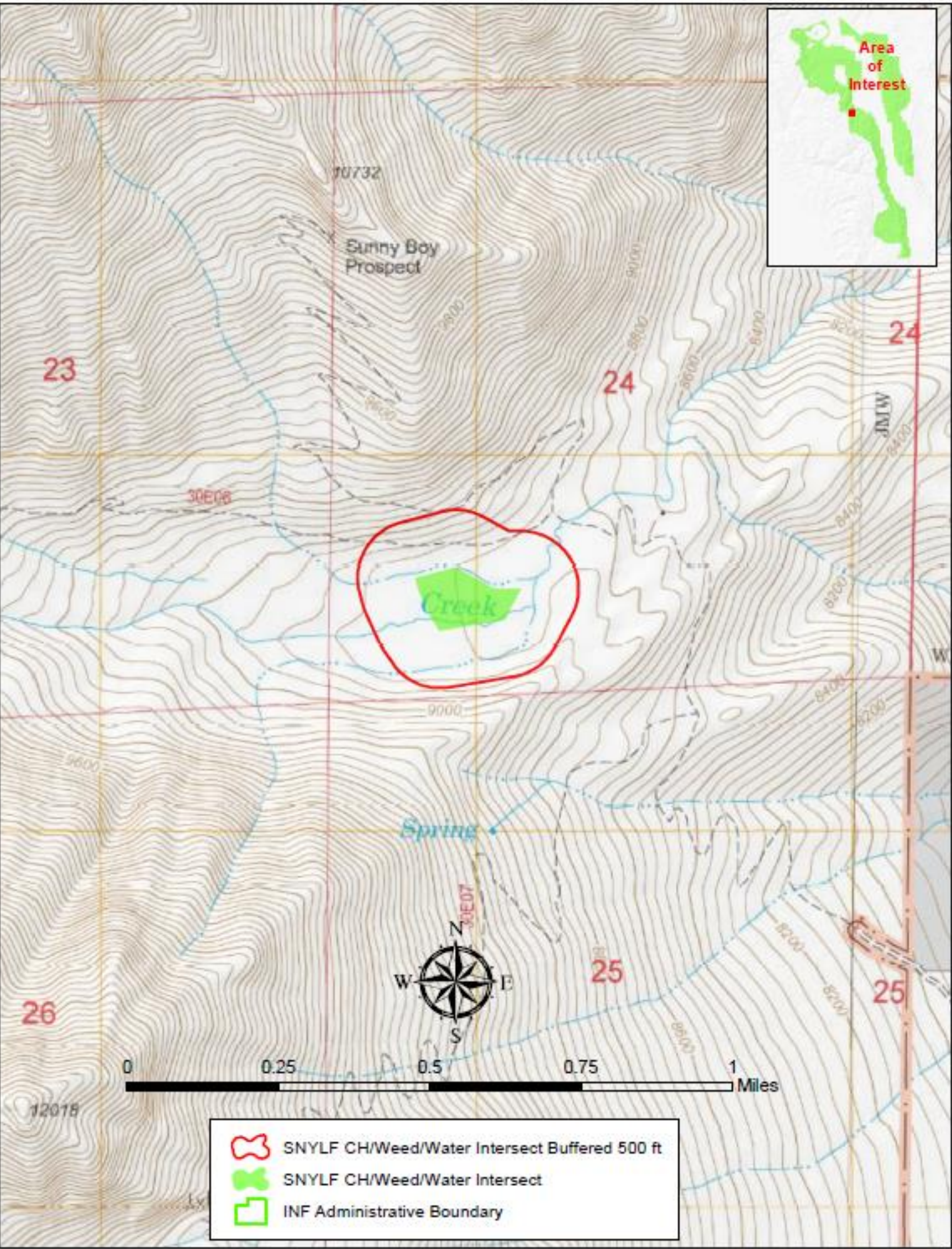


Figure 9 Sierra Nevada yellow-legged frog Evolution/Le Conte CH & Weed Locations

The two weed species are common dandelion and cheatgrass. Common dandelion is considered lowest for treatment strategy ranking number 4 (limited or no treatment) while cheatgrass is strategy number 3 (contain). Infestations in special status areas, such as listed species habitat, can be elevated in priority for treatment. As indicated in Appendix D common dandelion treatments can include; hand pull, dig, cut, and glyphosate while cheatgrass treatments can include; hand pull, dig, cut, biocontrol, animopyralid, chlorsulfuron, clethodim, flauzifop, glyphosate, and imazapyr.

Both infestation are within CH and adjacent to trout systems. Treating these site for frog habitat improvement would consider several factors including the rate of spread, potential for ecological negatively impact native flora species, and among other things the potential for irradiation success. The cheatgrass infestation has potential to be contained. . It is unlikely that the dandelion will receive treatment or get elevated priority due to the low likelihood for success of irradiation. Both sites have a low likelihood to detect individuals because of the proximity to aquatic systems following project design would apply.

20. Immediately prior to any treatment activities, a Forest Service biologist who is trained in identifying and handling rare amphibians will survey the area for SNYLF, MYLF and YT. If individuals are found they will be relocated to a safe location that is nearby but out of potential harm's way from treatment activities. In most cases this will be less than 100 feet from the original location of the amphibian.

Direct & Indirect Effects (both species)

The Sierra Nevada yellow-legged frog and mountain yellow-legged frog, northern DPS require similar habitats as shown in the species descriptions. Therefore, the effects of implementing the proposed action will be similar, and their analysis is collectively presented here. The majority of the habitat and critical habitat is located within Inyo NF designated wilderness with the exception of two sites:

1. For the Sierra Nevada yellow-legged frog, there is a small portion of the Evolution / Le Conte critical habitat subunit that lies outside of the John Muir Wilderness in the area around Baker Creek. This area in the Coyote Flat management unit contains the Cow Creek failed population that was extirpated in 2010 and the Baker Creek/Mother Meadow failed population that is believed extirpated in 2010 (California Department of Fish and Wildlife 2017). This area remains unoccupied currently.
2. The Birch Creek population in the Wheeler Ridge area, has a stable trend with 88 and 90 egg masses recorded in 2014 and 2015 respectively and continues to provide as a donor population.

Because weed infestations are currently small, it is all the more important to apply Early Detection Rapid Response (EDRR) practices to assure these weed populations do not expand. In general, high elevation, alpine habitat communities associated with wilderness on the eastern Sierra Mountains are not conducive to large infestations of noxious and invasive weeds. However, changing climates and the potential for a large disturbance such as wildfire, could introduce new infestations. Improving ecosystem integrity in the meadows and uplands that provide frog habitats may ameliorate local risk factors by improving the resiliency of frog populations. Therefore, it is also important to apply EDRR for all future weed infestations to help maintain native plant communities and high quality habitat for these frog.

Manual, Mechanical, Cultural, and Herbicide Treatments

Effects at occupied sites will be minimized by implementation of project design features. Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label, as well as temporal and spatial design features. Human disturbance from weed treatments (including hand pulling) may include encounters of individual frogs and cause them to be disperse. However, this disturbance would be temporary, lasting only the day (or two) of treatment. Project design feature (20) aims to avoid and prevent disturbance to individuals. Because of this PDF and limited temporal impact this would not result in any measurable impacts to the viability of individuals or the population.

Herbicides used to control annual grasses, including clopyralid, are used as a pre-emergent and are applied during the fall months. Non-native thistles and knapweeds would either be hand pulled or treated with an herbicide such as aminopyralid or chlorsulfuron. The ecological effects of the above herbicides as well as glyphosate, imazapyr, and triclopyr clethodim and fluzifop are further discussed in the Herbicide Toxicity section. SERA risk assessments were reviewed and indicate that at proposed application rates, the estimated doses from the exposure scenarios are all less than the reported NOAEL (no-observable adverse effect level) for all herbicides. Based on these assessments the herbicides and surfactants applied as described in the Proposed Action pose no risk to these species. Triclopyr can be sprayed on foliage but when used to treat woody species such as tamarisk it can be applied using hand application methods such as wick and wipe on individual plants or cut-stump application. Hand application methods minimize the risk of non-target exposure and accidental drift. The SERA risk assessments do not list or claim direct or indirect impacts to frogs from the use of proposed herbicides.

Weed infestations are often associated with disturbed areas such as road shoulders and camp grounds. Outside of designated wilderness existing roads and campgrounds occur around the unoccupied Coyote and occupied Birch Creek populations. The potential application of pesticides would be limited to site-specific herbicide applications for invasive species. Authorized roads within this area will likely be maintained at their current management level and may include weed treatments of various methods to reduce spread of weeds to non-infested areas. No effects will occur to individuals where the sites are unoccupied.

Biological Control

There is no identified need at this time to use biological controls in suitable habitats. However, a major disturbance such as wildfire may result in some localized expansions of noxious weeds where the use of biological control organism may be determined to be appropriate. Impacts from biological controls, such as insects, are discussed above in the Effects Common Habitat and Species section.

As described in the Effects Common to Habitats and Species, eliminating weeds indirectly contributes to riparian conservation areas objectives to provide beneficial functions such as providing cold, clean water; stream shading; aquatic/riparian habitat for indicator; and nutrients. There are also project design features that would avoid, mitigate, or minimize certain types of activities or intensities or magnitudes of effects within riparian conservation areas and to riparian resources (PDF#s 17, 32, 33, 34, 36, 37,). These design features collectively help assure stream, meadow, and riparian habitats are conserved and restored for long-term sustainability and resilience, and species long-term viability.

The Proposed Action includes the Annual Implementation Process which requires for all treatment methods; manual, mechanical, cultural, and chemical application, within 500 feet of known occupied Sierra Nevada yellow-legged frog and mountain yellow-legged frog, northern DPS sites to avoid adverse effects to individuals or their habitats (Project Design Feature 17).

In all cases pertaining to herbicide treatments in the Proposed Action, improving ecosystem integrity in terrestrial, aquatic and riparian systems that provide T&E habitats may ameliorate local risk factors by improving the resiliency of populations. Project design feature number 17 assures that any pesticide application within 500 feet of known occupied sites would avoid adverse effects to individuals or their habitats. There will be no negative impacts to habitat for these frogs under the Proposed Action.

Effects to Critical Habitats (both species)

As described above, all of the designated critical habitat for the northern DPS of the mountain yellow-legged frog and the majority of the designated critical habitat for the Sierra Nevada yellow-legged frog is within designated wilderness areas.

The treatment of these noxious and invasive weeds will be a negligible loss to existing habitat and will not result in a loss of Primary Constituent Elements in designated critical habitat. The application of any effective herbicide will damage at least some vegetation, and this damage may alter the suitability (either positively or negatively) of PCE in terms of habitat, microclimate, or food supply. Over the long term, control and eradication of noxious weeds will continue to maintain quality habitat of native flora for Sierra Nevada yellow-legged frog and mountain yellow-legged frog, northern DPS. Furthermore PDF 33 provides opportunity for active restoration, replanting of native vegetation if applicable.

The risk of effects are expected to be minimal or even beneficial because of project design features, and improvements to habitat/native species composition. Short-term effects to critical habitat for the frogs could occur during physical removal of non-native plants. Effects may include small amounts of ground disturbance where individual weeds are pulled, cut, mowed, and tarped as well as some minor trampling of native vegetation from crews working in the area. However, crew size for most treatments will generally be limited to only one to several people and treatments will likely only take one to two days a year to complete. Ground disturbance will occur only around individual plants and will affect only a small fraction of available habitat. Because the direct application methods of herbicides would be prioritized within habitat for frog species the potential for contamination or persistence of these chemicals in the soil or water is minimal due to the limit area within habitat and overall acres expected to be treated annually.

Overall, any negative effects to critical habitat from treatment methods will be minor and short term and will not adversely modify habitat conditions for the frogs. In the long-term, actions to control non-native plants would benefit critical habitat for Sierra Nevada yellow-legged frog and mountain yellow-legged frog by allowing native vegetation to recover and reducing the potential for future infestations to occur.

This Proposed Action is aligned with the numerous plan component direction in riparian areas to protect and enhance riparian ecosystem, riparian vegetation, water quality, soils, fish, and wildlife resources (Appendix B & C). Plan components guide development of project design features for this projects to protect and improve beneficial functions such as providing cold, clean water; stream shading; and aquatic and riparian habitat. These collectively help assure stream and riparian habitats are conserved and restored for long-term sustainability and resilience, and species long-term viability, although they may have short-term impacts.

Given the limited amount of acreage known within critical habitat and proposed treatment priorities and strategies (appendix D), impacts to PCE would not likely to adversely affect critical habitat but remains unknown into the future. The potential for beneficial effects by improving species composition and biodiversity of flora to the ecosystem would contribute to the primary constituent elements related to aquatic and terrestrial habitat by reducing infestations of noxious weeds into these habitats.

Cumulative Effects (*both species*)

The cumulative effects analysis area for the Sierra Nevada yellow-legged frog and mountain yellow-legged frog is the Inyo NF plan area encompassing the designated critical habitats for both species. This is an appropriate scale for determining cumulative effects since this area includes all habitat potentially affected by implementation of the proposed action. The cumulative effects time frame is 15 years into the future. The cumulative effects of all past non-federal actions are incorporated into the existing condition.

The majority of the critical habitat for these species occurs within designated wilderness. As such, there are few non-federal lands within or near critical habitats. There are a few scattered isolated private land parcels in the area outside of wilderness in critical habitat subunit. It is unknown what activities occur on those parcels.

Some non-federal future actions, such as those identified in the Cumulative Effects Common to All Species Section, may affect these species and their habitats in the plan area such as fish stocking by CDFW. The CDFW is expected to continue to monitor populations of these species and to analyze and implement native species restoration projects involving fish removal and activities related to translocation of populations or other actions to manage and restore populations. CDFW also engages in and is expected to continue to engage in management for other state threatened or endangered species or species of state concern such as the golden trout. The other substantial non-federal action that may occur in the cumulative effects area is fish stocking by CDFW into designated locations for recreational sportfishing.

Non-native invasive species have prolific seeding rates that quickly colonize in disturbed settings. Wildfire events, in particular, can pose the highest risk for weed spread with bare ground, high nutrient availability and a lack of competing plants. Treatments of newly discovered (currently unmapped) infestations or species of invasive plants would occur according to the Early Detection Rapid Response (EDRR) approach, which is designed to allow for control of new invasive plant infestations as soon as possible after their detection. EDRR treatments could occur outside of currently mapped areas, but treatments in these areas would be subject to the Annual Implementation Process.

Given these and other potential non-federal future actions, we do not anticipate a significant increase in the level of impacts to these species' population in the project area beyond what has already been noted in the analysis of effects resulting from implementing the Proposed Action.

Determination (both species)

Key conclusions:

- There are portions of six yellow-legged frog, northern (DPS) mountain yellow-legged frog critical habitat subunits covering approximately 97,046 acres occur on the Inyo NF and the three known weed site accounts for 0.2%.
- Sierra Nevada yellow-legged frog and mountain yellow-legged frog are primarily within wilderness boundaries are limited and there are few high-priority invasive plants currently known therefore treatments in suitable habitat are expected to be limited in scope and scale. Furthermore wilderness areas tend to have small potential for noxious weed populations to occur in frog habitat due to few vectors and extensive disturbance, and environmental conditions that are not conducive to many invasive species life cycle.
- Relocating of individuals to a safe location away from treatment activities is likely to occur and would be considered harassment.
- Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.
- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- Given the limited amount of currently known acreage within critical habitat and proposed treatment priorities and strategies (appendix D), as well as the limited vectors, resilient habitat, and high-elevation environmental conditions (lead to low likelihood of future introductions) we expect future levels of infestations to be similar (low) but remains unknown into the future.
- The potential for beneficial effects by improving species composition and biodiversity of flora to the ecosystem would contribute to the primary constituent elements related to aquatic and terrestrial habitat by reducing infestations of noxious weeds into these habitats.

- Almost all critical habitat occurs within designated wilderness which limits many ground-disturbing activities that could adversely affect habitat. The following Project Design Features for Federally Threatened or Endangered Amphibians (Sierra Nevada yellow-legged frog (SNYLF), northern (DPS) Mountain Yellow-Legged Frog (MYLF) will apply:
17. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within SNYLF, MYLF or YT designated critical habitat or within 500 feet of known occurrences. Treatment strategies in these areas, including applying buffers, limited operating periods, and relocating individual amphibians, will be developed collaboratively on an annual basis by the Noxious Weed Coordinator and the Forest Fisheries Biologist to ensure treatment efforts minimize impacts to frog and toad populations and critical habitat.

In occupied habitat the following restrictions apply:

20. Immediately prior to any treatment activities, a Forest Service biologist who is trained in identifying and handling rare amphibians will survey the area for SNYLF, MYLF and YT. If individuals are found they will be relocated to a safe location that is nearby but out of potential harm’s way from treatment activities. In most cases this will be less than 100 feet from the original location of the amphibian.
21. Chemical treatments within 50 feet of active breeding locations for SNYLF, MYLF and YT would be limited to direct foliar, spot spray, or hand application of glyphosate, imazapyr, or triclopyr-TEA until after metamorphosis has occurred. Metamorphosis typically occurs around July 31st and will be confirmed with a site-specific survey prior to treatment.

Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by weed activities, implementation of the proposed action *may affect, likely to adversely affect* the northern distinct population segment of the mountain yellow-legged frog and Sierra Nevada yellow-legged frog.

Although most Sierra Nevada yellow-legged frog critical habitat occurs in wilderness and this limits herbicide treatment options for weeds and the potential for weed infestations, a small portion of habitat occurs outside of designated wilderness. Because weed management could occur in critical habitat overall, any negative effects to primary constituent elements from treatment methods will be minor and short term and will not adversely modify habitat conditions for the frogs we determine that adoption of the Proposed Action *may affect, likely to adversely affect designated critical habitat* of the for the Sierra Nevada yellow-legged frog on the Inyo National Forest.

All of the critical habitat for the northern DPS of the mountain yellow-legged frog occurs in wilderness and this limits our ground disturbing management actions. However, overall, any negative effects to primary constitute elements from treatment methods will be minor and short term and will not adversely modify habitat conditions for the frogs we determine that adoption of the Proposed Action *may affect, likely to adversely affect designated critical habitat* for the northern DPS of the mountain yellow-legged frog on the Inyo National Forest.

Yosemite Toad and Critical Habitat

The 2015 Yosemite Toad Conservation Assessment (Brown et al. 2015); USFWS listing rule (United States Department of the Interior 2014b); and USFWS rule designating critical habitat (United States Department of the Interior 2016a) describes in detail the current habitat, life history, and risk factors and is the source for the following species information unless otherwise noted. Since this biological assessment summarized from these sources, many of the original supporting literature citations are contained in them and are not repeated here unless needed for clarity.

Classification, critical habitat and Recovery Plan

In 2002, the USFWS determined that listing was warranted for this species; however, the listing was precluded at the time based on other higher priority issues (United States Department of the Interior 2002). The Yosemite toad was listed as a threatened species in 2014 (United States Department of the Interior 2014b). Final critical habitat was designated in 2016 to include approximately 1,812,164 acres in Alpine, Amador, Calaveras, El Dorado, Fresno, Inyo, Lassen, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tulare, and Tuolumne Counties, California. (United States Department of the Interior 2016a). Of the 16 critical habitat units, five are located on the Inyo NF, covering approximately 83,939 acres (Table 11, Figure 10). Critical habitat Unit 15, Upper Goddard Canyon, has approximately 4 acres of overlap on the Inyo NF which are essentially small slivers along the forest boundary with Kings Canyon National Park and are all in the John Muir Wilderness. A Recovery Plan for Yosemite toad has not been completed.

Yosemite toad is also listed by the State of California as a Species of Special Concern. A collaborative inter-agency Yosemite Toad Conservation Assessment was completed in 2015 with the USFS, CDFW, National Park Service, and USFWS (Brown et al. 2015). The Conservation Assessment was developed and reviewed by a Yosemite toad working group that included representatives from the above mentioned agencies along with species experts and academic institutions such as the University of California, Berkeley and Sierra Nevada Aquatic Research Laboratory (Brown et al. 2015).

Table 11 Acres of Yosemite toad Critical Habitat Units (CHU)

CHU Number	CHU Name	Total CHU Acres	CHU Acres – Inyo NF	CHU Acres – Inyo NF Wilderness
4	Hoover Lakes	5,679	698	687
5	Tuolumne Meadows/Cathedral	139,434	37,797	34,095
12	Silver Divide	98,578	36,160	33,720
13	Humphreys Basin/Seven Gables	50,930	9,281	8,723
15	Upper Goddard Canyon	36,731	4	3

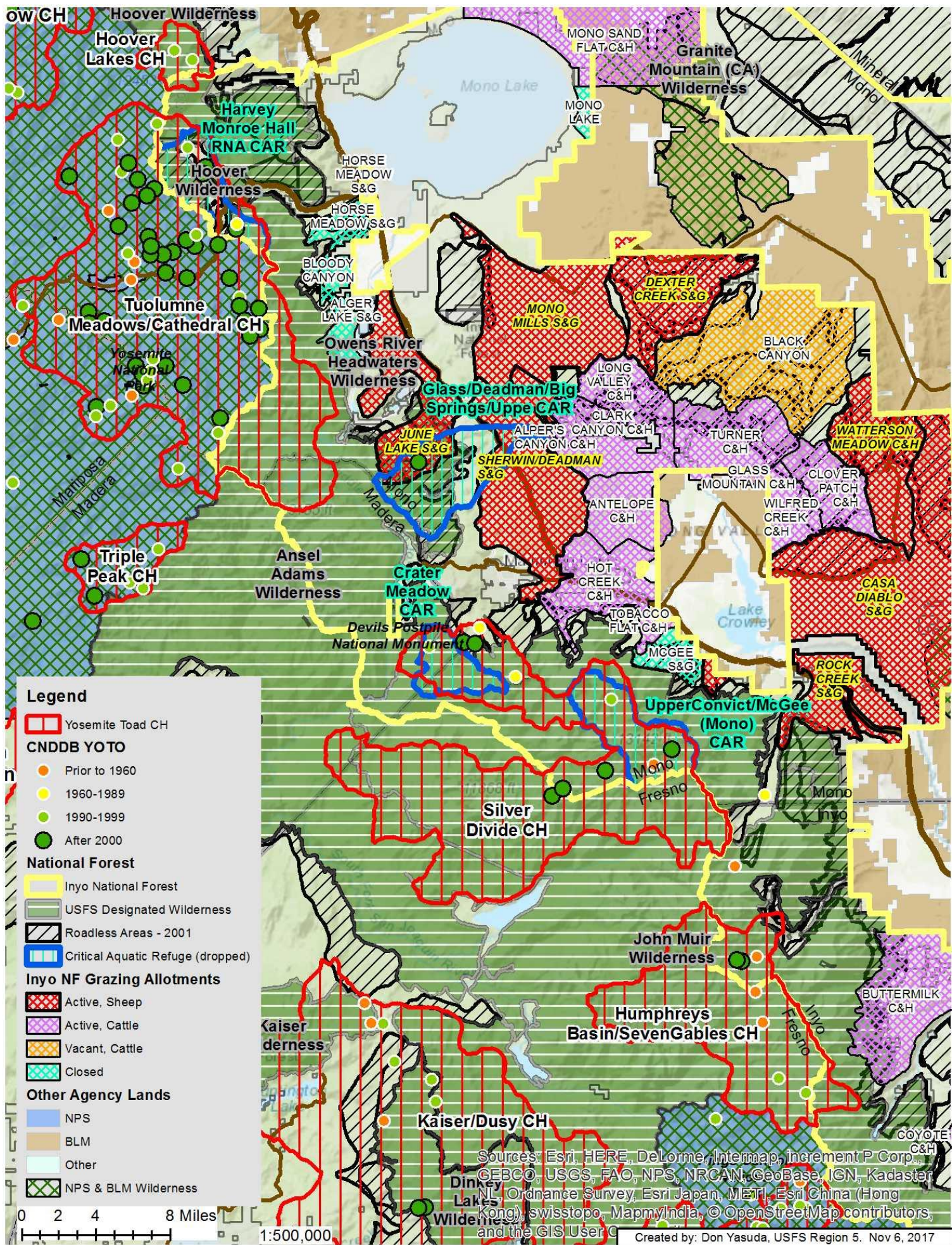


Figure 10 Map of Yosemite Toad Critical Habitat Units

The USFWS (United States Department of the Interior 2016a) has determined that the primary constituent elements specific to the Yosemite toad are:

- 1) *Aquatic breeding habitat.*
 - a) This habitat consists of bodies of fresh water, including wet meadows, slow-moving streams, shallow ponds, spring systems, and shallow areas of lakes, that:
 - i) are typically (or become) inundated during snowmelt;
 - ii) Hold water for a minimum of 5 weeks, but more typically 7 to 8 weeks; and
 - iii) Contain sufficient food for tadpole development.
 - b) During periods of drought or less than average rainfall, these breeding sites may not hold surface water long enough for individual Yosemite toads to complete metamorphosis, but they are still considered essential breeding habitat because they provide habitat in most years.
- 2) *Upland areas.*
 - a) This habitat consists of areas adjacent to or surrounding breeding habitat up to a distance of 1.25 km (0.78 mi or 4118 ft) in most cases (that is, depending on surrounding landscape and dispersal barriers), including seeps, springheads, talus and boulders, and areas that provide:
 - i) Sufficient cover (including rodent burrows, logs, rocks, and other surface objects) to provide summer refugia,
 - ii) Foraging habitat,
 - iii) Adequate prey resources,
 - iv) Physical structure for predator avoidance,
 - v) Overwintering refugia for juvenile and adult Yosemite toads,
 - vi) Dispersal corridors between aquatic breeding habitats,

- vii) Dispersal corridors between breeding habitats and areas of suitable summer and winter refugia and foraging habitat, and/or
- viii) The natural hydrologic regime of aquatic habitats (the catchment).
- b) These upland areas should also maintain sufficient water quality to provide for the various life stages of the Yosemite toad and its prey base.

Habitat and Life History

Yosemite toads occupy both aquatic and terrestrial habitats. They breed and rear primarily in shallow still water habitat; use meadows, springs, and terrestrial upland habitats for foraging, refuge, and movements; and overwinter in underground terrestrial sites. Tadpoles develop rapidly in very shallow, typically ephemeral aquatic habitats. Mortality from the period of eggs through metamorphosis can be very high, with abiotic factors (desiccation and/or freezing) sometimes causing total or near loss of a year’s cohort. Mortality of small postmetamorphic toads also appears high, likely because of high overwinter mortality. The long-lived adults may be key to long-term persistence of populations given the low recruitment in some years. Post-metamorphic life stages (juveniles and adults) occupy habitats some distance from breeding sites seasonally. Little is known about seasonal movements, especially for juveniles, but movements that range several hundred meters from breeding sites are recorded for adults.

These features provide breeding habitat for the Yosemite toad, which prefer meadow edges without deep water or adjacent steep terrain. Terrestrial habitats utilized by Yosemite toad adults vary, particularly by elevation, and include forests, meadows, shrublands, rock outcrops, and talus. Mid-elevation meadows occur in yellow pine (mixed conifer) and lower edges of lodgepole-red fir forests. Meadows above 7,500 feet generally occur in lodgepole-red fir, subalpine and alpine ecosystems. Higher subalpine and alpine areas tend to be more open than lower elevation regions.

A geographic information system analysis identified 2,133,951 acres within 4,100 feet surrounding meadows above 6,000 feet elevation on the Inyo NF. These distances and elevations reflect the maximum extent of potentially suitable habitat and are based upon information in the listing findings (United States Department of the Interior 2014b). An evaluation of this data further refined by examining areas of known occupancy and professional opinions about the potential for occupancy estimates that approximately 420,643 acres of this potentially suitable habitat surround areas that are known to be occupied, or utilized, and an additional 29,053 acres surround areas potentially occupied (Figure 11).

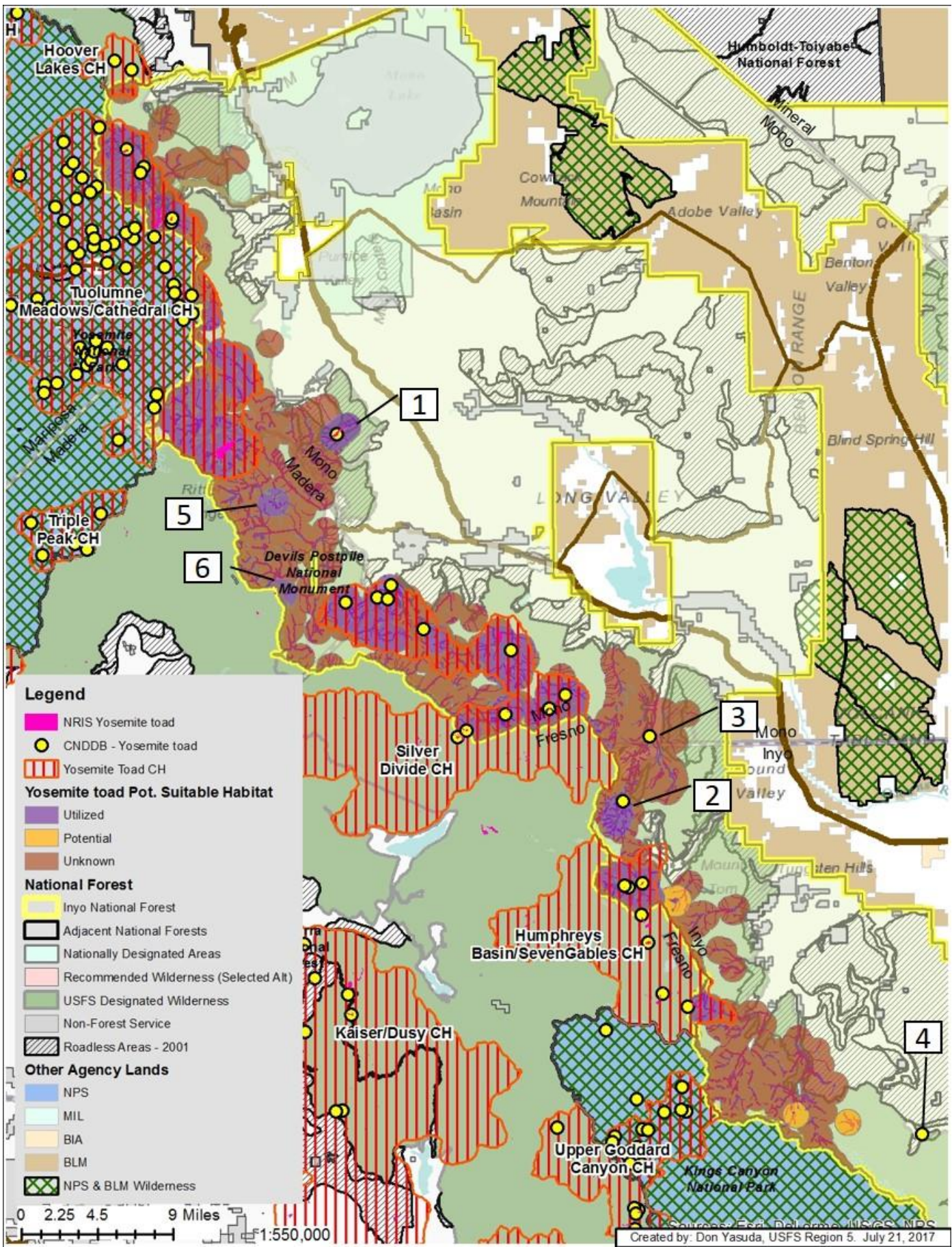


Figure 11 Map of potential suitable habitat and known occurrences of Yosemite toad

Historic and Current distribution

The elevational range for Yosemite toad is approximately 6,000 feet to more than 11,910 feet (United States Department of the Interior 2014b). The Yosemite toad is endemic to the Sierra Nevada and its range extends from north of Ebbetts Pass (Alpine County) south to approximately the Kings River (Fresno County). This includes the southern portion of the Eldorado NF south through the Stanislaus NF, Toiyabe NF, Inyo NF, Yosemite National Park, and Sierra NF to the northern portion of Sequoia and Kings Canyon National Parks (Figure 12).

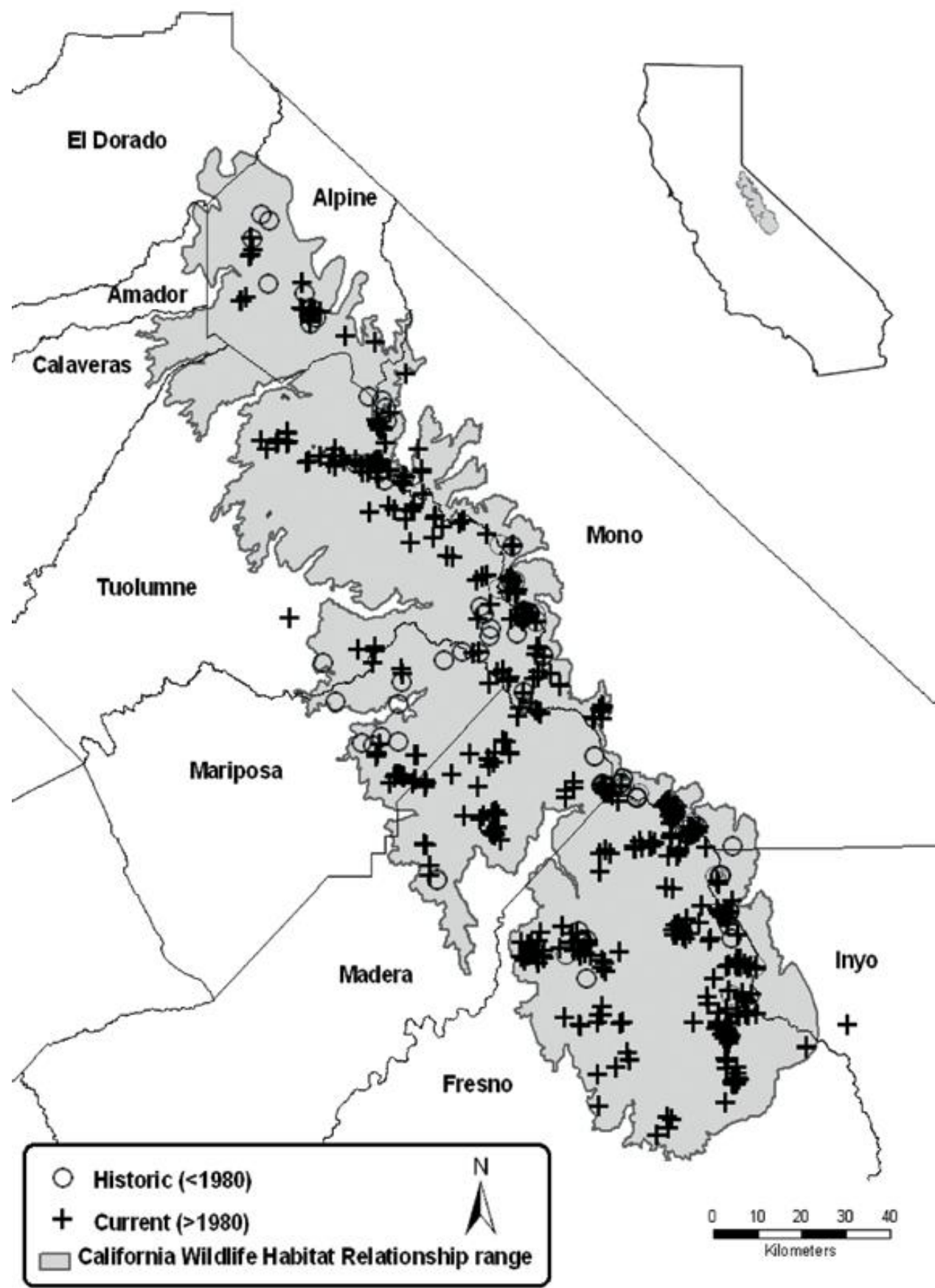


Figure 12 Historical and recent localities (2002-2003) for the Yosemite toad (*Anaxyrus canorus*) in the Sierra Nevada, California

Yosemite toad is currently found in many parts of the historic range but at lower abundance and with many individual sites no longer occupied. On the Inyo NF, there are 22 sites, with 276 known Yosemite toad locations. Populations are found in the higher elevations of the forest from the Lundy Canyon area south to the Piute Pass area. Of these 276 locations, 238 (or 86 percent) are located within designated wilderness areas and 38 are found outside designated wilderness. The current records from the California Natural Diversity Database and the USFS Natural Resource Information System (NRIS) wildlife observation database are shown above. Most known occurrences are located with critical habitat units. However, six occurrences are outside of critical habitat units briefly described in Table 12.

Table 12 Notes on six Yosemite toad occurrences outside critical habitat

General Location	Detections
Glass Creek Meadow	Single CNDDB detection from August 2003; NRIS detections 1993, 1994, 1999, 2000, 2004 from single adult to 200 unreported age
Little Lakes Basin	Single CNDDB detection from August 1933; NRIS detections 2000, 2002, 2003, 2009 from single adult to 200 unreported age
Rock Creek	One CNDDB detection from September 1960
Glacier Lodge	One CNDDB detection from August 1984
Lois Lake	NRIS detection July 2002, one unreported age
Summit Meadow	NRIS detection August 2004, 62 unreported age

A small portion of the Silver Divide unit of critical habitat lies outside of wilderness and includes the recreation areas in the Mammoth Lakes Basin around Lake Mary and Crystal Lake (Figure 13).

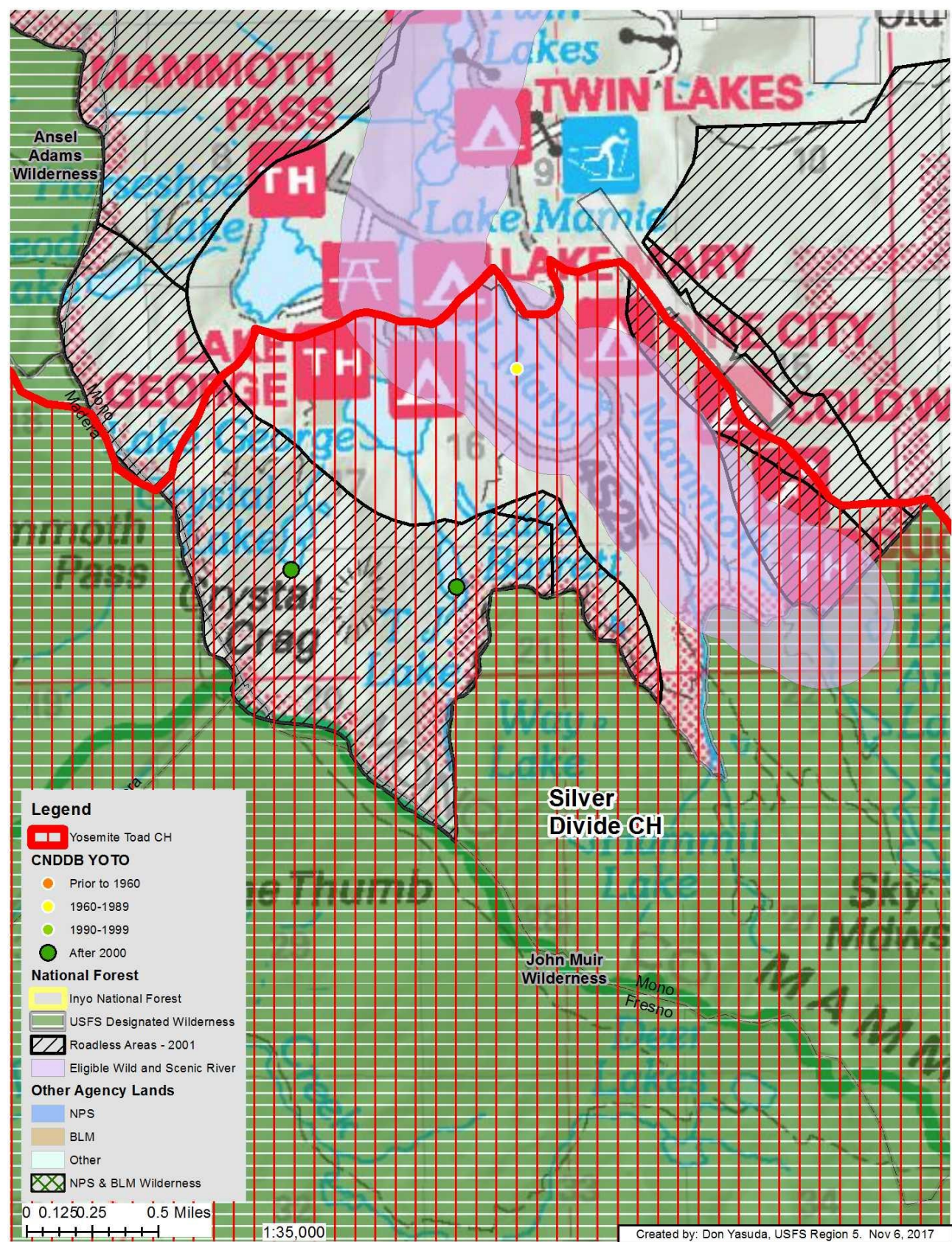


Figure 13 Map of Silver Divide critical habitat Unit outside wilderness near Lake Mary

Population and Habitat Status and Trend

The Yosemite toad was once a common amphibian in high-elevation aquatic ecosystems of the Sierra Nevada. Historical data is limited so changes in population are uncertain, but evidence suggests it has declined over the last 20 years. The conservation assessment summarized several studies that have examined the distribution of Yosemite toad prior to 1990 and in 1999-2000 which suggest that Yosemite toads only occupied 13 percent of historical locations. Yosemite toad populations in the Sierra Nevada declined from their local historical abundance levels and some populations appear very small. It is not known whether these populations are persisting at low numbers or whether they are on a slow trajectory to extirpation.

The decline in occupancy and abundances suggest fragmentation may be an increasing problem for this species. If the species typically functions as metapopulations, opportunities for these dynamics to exist have become more limited. Small, isolated populations are more susceptible to local extirpation and loss of genetic diversity, while fragmentation reduces the chances of recolonization following extirpation events.

Although the numbers and abundances of Yosemite toad populations have been reduced, populations remain in many parts of the toad’s historical range. Thus, the opportunity exists for pro-active conservation to prevent further declines.

Threats

The Conservation Assessment was completed after the species listing and provides a detailed examination of risks to the Yosemite toad throughout its range (Brown et al. 2015). It identified several risk factors that currently are not likely to be major causes of rangewide declines but may be important in specific situations, particularly where toad populations are small. There are 11 risk factors relevant to land and resource management: 1) Fire Management, including fire suppression; 2) Habitat Loss, Urbanization and Fragmentation; 3) Introduced fish and other predators; 4) Livestock Grazing; 5) Locally Applied Pesticides; 6) Recreational Activities including Pack stock; 7) Research Activities; 8) Restoration; 9) Roads; 10) Vegetation and Fuels Management; and 11) Water Development and Diversion. It further identified that legacy effects from some of these risk factors (e.g., livestock grazing) may have contributed to Yosemite toad declines, particularly those that resulted in meadow drying, shortened hydroperiods of breeding habitats, and potentially, lowered breeding success. Some improved management may have lessened the impacts of some of these risk factors but other legacy impacts may remain.

There is a low risk on the Inyo NF because almost all of the habitat and critical habitat for Yosemite toad is within designated wilderness where the following risk factors are not contemporary or relevant:

- Habitat loss, urbanization, and fragmentation is not a threat because human development and associated road development does not occur within wilderness.
- Research activities are a generally considered a low risk because permits are required from the USFWS and CDFW before impacting the species or its habitat. Some elements of research activities would be governed by direction in the forest plan. In particular, within wilderness, there are restrictions on mechanized activities and ground-disturbing activities. If ground disturbing activities are proposed, a separate permit from the Inyo NF might also be required.
- Water development and diversions would generally not occur within wilderness.

Inyo NF actions on these risk factors are evaluated at the project level and either mitigated to result in no effect or included into the “BATCH” for the USFWS Programmatic Biological Opinion for the 3 Sierra Nevada Amphibians. Except locally applied pesticides which are exempt from the batching system.

Locally Applied Pesticides

The conservation assessment (Brown et al. 2015) provides a thorough review of herbicides commonly used on national forest of which six of the eight herbicides listed for use under the Proposed Alternative are included. The conservation assessment (January 2015) does not include clethodim and flauzifop-P-Butyl likely because the SERA risk assessments were not available until October and July, 2015 respectively. The conservation assessment does not describe any significant threats related to this species, suitable habitat, and or surrogates associated with the application methods and chemical use listed under the proposed action. The same is true for SERA risk assessments on clethodim and flauzifop-P-Butyl. Clethodim is classified as moderately toxic to aquatic invertebrates and slightly to practically non-toxic to fish. Clethodim and flauzifop-P-butyl have no information regarding toxicity to terrestrial-phase amphibians. EPA ecological risk assessments use birds as surrogates for amphibians and reptiles. Furthermore, while no data are available on the permeability of amphibian skin to clethodim and Flauziflop-P-butyl, no significant results are reported when mammalian skin (pig) are used as a surrogate of the structure and function of amphibian skin.

Livestock Grazing

Currently, on the Inyo NF, there is no active grazing allotments within Yosemite toad critical habitat units or in habitats occupied by Yosemite toads.

Analysis of Effects

Current Noxious Weeds locations within Yosemite toad Habitat:

Within the project area, there are currently two mapped weed infestations, totaling approximately 1.37 acres, within 500 feet of habitat for Yosemite toad. These two weed locations to occur in toad critical habitat. Of the 16 toad critical habitat units, five are on the Inyo NF, covering approximately 83,939 acres of which 0.002% account for two known weed locations total acreage (Table 13). Containing and or treating each site would account for 0.003% of CHU #5 (

Figure 14) and 0.004% of CHU #13 (

Figure 15) total area.

Table 13 Acres of Yosemite toad critical habitat Units (CHU)

CHU #	CHU Name	Total CHU Acres	CHU Acres – Inyo NF	CHU Acres – Inyo NF Wilderness	Weed Acres	Weed Species	Treatment Method
4	Hoover Lakes	5,679	698	687	0	N/A	N/A
5	Tuolumne Meadows/Cathedral	139,434	37,797	34,095	1	⁴ Field Bindweed	#3 Contain
12	Silver Divide	98,578	36,160	33,720	0	N/A	N/A
13	Humphreys Basin/Seven Gables	50,930	9,281	8,723	0.37	Birds-foot Trefoil	#3 Contain
15	Upper Goddard Canyon	36,731	4	3	0	N/A	N/A

⁴ Photograph of this Field Bindweed infestation is depicted on cover page of BA

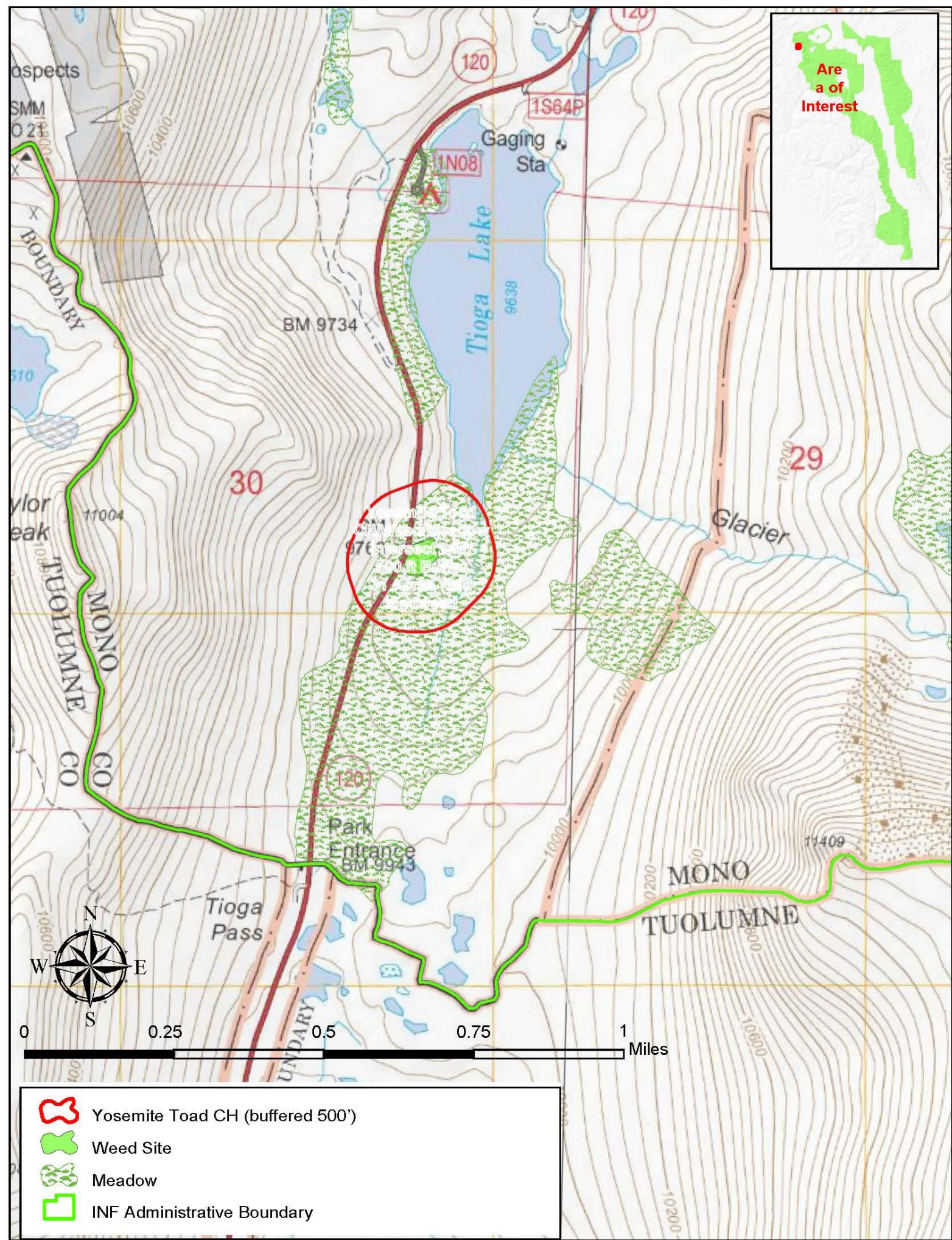


Figure 14 Yosemite Toad Tuolumne Meadows/Cathedral Critical Habitat & Tioga Lake Weed Site

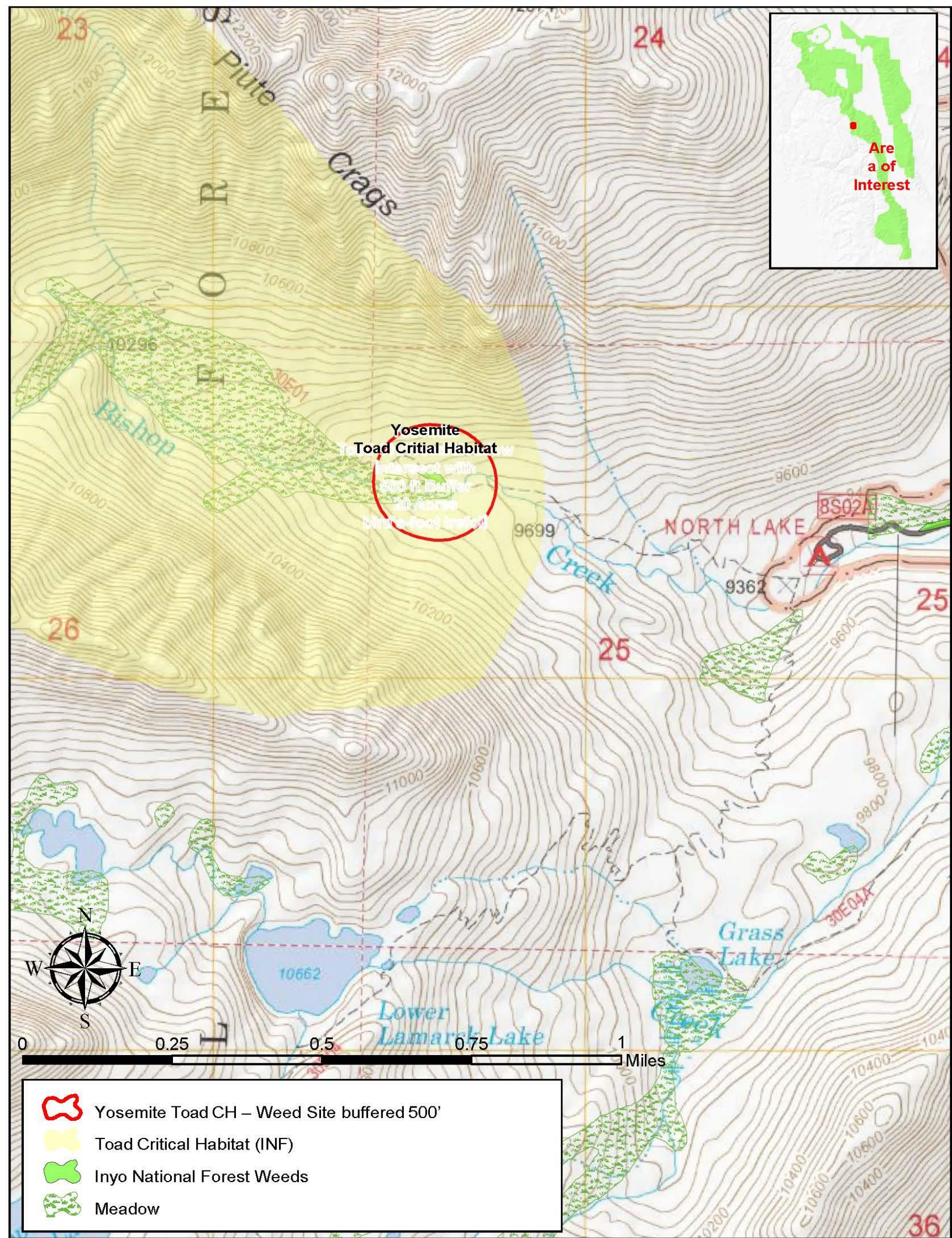


Figure 15 Yosemite Toad Humphreys Basin/Seven Gables Critical Habitat & Bishop Creek Weed Site

The two weed species are field bindweed and birds-foot trefoil located at two different locations.

Location 1- Tioga Pass) Bindweed infestation is the photo on the cover page of this BA located on Hwy 120 road prism growing in gravel along the road embankment and shoulder. As seen in the map above this site is adjacent to meadow systems associated with Tioga Lake (occupied habitat). Although the weed site is within 500' of aquatic systems it grows on highly disturbed environment subject to daily traffic disturbance, therefore is not suitable habitat and treatment will not affect PCE. As indicated in Appendix D field bindweed treatments include; hand pull, dig, cut, tarp, animopyralid, chlorsulfuron, glyphosate, imazapyr, and triclopyr. According to the treatment table and current opinion of Inyo NF Botanist the preferred method would be to treat with herbicide and or tarp. There is a potential that this weed species could expand into adjacent meadow systems. Treatment of this site for the protection of special status areas (listed species habitat) is an example of how treatments can be elevated in priority for T&E habitat protection. This is an excellent example of short term effects with long term benefits. This one acre weed infestation could spread to suitable occupied habitat without the multiple annual treatments for a few year required for successful eradication. Implementing will provide invasive plant-free condition in occupied suitable habitat using the Early Detection Rapid Response.

Because Tioga Lake is occupied toad habitat and this weed site is within 500' the following project design features would apply to avoid adverse effects:

21. Immediately prior to any treatment activities, a Forest Service biologist who is trained in identifying and handling rare amphibians will survey the area for SNYLF, MYLF and YT. If individuals are found they will be relocated to a safe location that is nearby but out of potential harm's way from treatment activities. In most cases this will be less than 100 feet from the original location of the amphibian.
22. Chemical treatments within 50 feet of active breeding locations for SNYLF, MYLF and YT would be limited to direct foliar, spot spray, or hand application of glyphosate, imazapyr, or triclopyr-TEA until after metamorphosis has occurred. Metamorphosis typically occurs around July 31st and will be confirmed with a site-specific survey prior to treatment.

Location 2 - Bishop Creek) Birds-foot trefoil is approximately 0.35 acres and on the edge of a meadow systems along Bishop Creek, N.W of North Lake. It is on the edge of Humphrey Basin/Seven Gables Critical Habitat subunit and Designated Wilderness. It is unlikely occupied but adjacent to potentially suitable habitat. As indicated in Appendix D birds-foot trefoil treatments include; hand pull, dig, and cut, animopyralid, clopyralid, glyphosate, and triclopyr. According to the Botanist the preferred method would be to treat by hand-digging for multiple years and possibly spray as follow-up until eradicated.

Because weed site is within 500' of potential habitat the following project design features would apply to avoid adverse effects:

20. Immediately prior to any treatment activities, a Forest Service biologist who is trained in identifying and handling rare amphibians will survey the area for SNYLF, MYLF and YT. If individuals are found they will be relocated to a safe location that is nearby but out of potential harm's way from treatment activities. In most cases this will be less than 100 feet from the original location of the amphibian.

Direct & Indirect Effects

Under the proposed action, treatment and control of noxious weeds would benefit Yosemite toads over the long term by improving and maintaining suitable habitat conditions. Disturbance associated with treatment activities would be mitigated with design feature 20. Because weed infestations in Yosemite toad habitat are currently small (1.37 ac), it is all the more important to apply Early Detection Rapid Response (EDRR) practices to assure these weed population does not expand. In general, high elevation, alpine habitat communities associated with Yosemite toads are not conducive to large infestations of noxious and invasive weeds. However, changing climates and the potential for a large disturbance such as wildfire, could introduce new infestations. Improving ecosystem integrity in the meadows and uplands that provide Yosemite toad habitats may ameliorate local risk factors by improving the resiliency of Yosemite toad populations. Therefore, it is also important to apply EDRR for all future weed infestations to help maintain native plant communities and high quality habitat for the Yosemite toads.

Although the majority of the treatments will likely occur outside of wilderness, treatments may occur if priority noxious or invasive weed are detected and protects habitat for T&E species. Herbicides would be applied by hand application wherever feasible with buffers around aquatic features to mitigate impacts to riparian resources.

Manual, Mechanical, Cultural, and Herbicide Treatments

Weed treatment occurring within known locations where water is expected would be limited to direction of application label as well as design feature buffers depending and time of year. The proposed action is not in water bodies and where systems are experiencing drought or in ephemeral systems botanist can determine these areas based on aquatic associated species. Human disturbance from weed treatments (including hand pulling, tarping, mowing) may encounter individuals and cause them to be disperse. However, this disturbance would be temporary, lasting only the day (or two) and would not result in any measurable impacts to the viability of individuals or the population. Tarping over burros used by toads will be addressed during the annual review within 500' buffers, every effort will be made to select treatments that avoid adverse effects however toads in burros may indirectly become trapped under a tarp. Herbicides used to control annual grasses, including clopyralid are used as a pre-emergents that are applied during the fall months. Non-native thistles and knapweeds would either be hand pulled or treated with an herbicide such as aminopyralid or chlorsulfuron. The ecological effects of the above herbicides as well as glyphosate, imazapyr, and triclopyr are further discussed in Herbicide Toxicity. There will be no direct or indirect impacts to this toad from the use of herbicides. SERA risk assessments were reviewed and indicate that at proposed application rates, the estimated doses from the exposure scenarios are all less than the reported NOAEL (no-observable adverse effect level) for all herbicides. There are no acute or chronic exposure scenarios at application rates described in the Proposed Action that will result in a Hazard Quotient (HQ) above one for fish. Herbicides and surfactants applied as described in the Proposed Action pose no risk to these species. Triclopyr can be sprayed on foliage but when used to treat woody species such as tamarisk it can be applied using hand application methods such as wick and wipe on individual plants or cut-stump application. Hand application methods minimize the risk of non-target exposure and accidental drift. Based on the SERA risk assessments there will be no direct or indirect impacts to toads from the use of herbicides.

Weed infestations are often associated with disturbed areas such as road shoulders and camp grounds. There are existing roads and campgrounds around Lake Mary but no roads around the other occupied sites (Crystal Lake and T.J. Lake) outside of designated wilderness. The potential application of pesticides would be generally limited to site-specific herbicide applications for invasive species and potential treatment of campgrounds and road shoulders., roads will likely be maintained and include weed treatments of various methods to a standard that supports the higher use levels, similar to the current condition. No effects will occur to individuals where the sites are unoccupied. Effects at occupied sites will be minimized by implementation of project design features.

Because the Yosemite toad are primarily within wilderness boundaries and there are few high-priority invasive plants currently known therefore treatments in suitable habitat are expected to be limited in scope and scale. Furthermore wilderness areas tend to have small potential for noxious weed populations to occur in frog habitat due to few vectors and extensive disturbance, and environmental conditions that are not conducive to many invasive species life cycle.

Biological Control

There is no identified need at this time to use biological controls in suitable habitats. However, a major disturbance such as wildfire may result in some localized expansions of noxious weeds where the use of biological control organism may be determined to be appropriate. Impacts from biological controls, such as insects, are discussed above in the Effects Common Habitat and Species section.

The Proposed Action includes the Annual Implementation Process would requires for all treatment methods; manual, mechanical, cultural, and chemical application, within 500 feet of known occupied Yosemite toad sites to minimize adverse effects to individuals or their habitats.

17. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within SNYLF, MYLF or YT designated critical habitat or within 500 feet of known occurrences. Treatment strategies in these areas, including applying buffers, limited operating periods, and relocating individual amphibians, will be developed collaboratively on an annual

basis by the Noxious Weed Coordinator and the Forest Fisheries Biologist to ensure treatment efforts minimize impacts to frog and toad populations and critical habitat.

As described in the Effects Common to Habitats and Species, eliminating weeds indirectly contributes to riparian conservation areas objectives to provide beneficial functions such as providing cold, clean water; stream shading; aquatic/riparian habitat for indicator; and nutrients. There are also many specific standards and guidelines that would avoid, mitigate, or minimize certain types of activities or intensities or magnitudes of effects within riparian conservation areas and to riparian resources. These plan components collectively help assure stream, meadow, and riparian habitats are conserved and restored for long-term sustainability and resilience, and species long-term viability.

There will be no negative impacts to habitat for this toad under the Proposed Action. The treatment of these noxious and invasive weeds will be a negligible loss to existing habitat and will not impact this species. Over the long term, control and eradication of noxious weeds will continue to maintain quality habitat of native flora for Yosemite toad.

Effects to Critical Habitats

The effects to critical habitat for Yosemite toad are very similar to those described for the mountain yellow-legged frog and Sierra Nevada yellow-legged frog above because the majority of critical habitat is also located in designated wilderness.

The potential risk of weed to critical habitat occurs primarily in the small portion of critical habitat located outside of designated wilderness around high recreation destination such as Lake Mary. Short-term effects to critical habitat for the Yosemite toad could occur during physical removal of non-native plants. Effects may include ground disturbance where individual weeds are pulled, cut, mowed, and tarped, as well as some minor trampling of native vegetation from crews working in the area. However, crew size for most treatments will generally be limited to only two people and treatments will likely only take one to two days a year to complete. Ground disturbance will occur only around individual plants and will affect only a small fraction of available habitat. Because the direct application methods of herbicides would be prioritized within habitat for Yosemite toad and does not include water, the potential for bioaccumulation of these chemicals in the soil or water is minimal. Overall, any negative effects to critical habitat from treatment methods will be minor and short term and will not adversely modify habitat conditions for the Yosemite toad. In the long-term, actions to control non-native plants would benefit critical habitat for Yosemite toad by allowing native vegetation to recover and reducing the potential for future infestations to occur.

Given the limited amount of acreage known within critical habitat and proposed treatment priorities and strategies (appendix D), impacts to PCE within critical habitat would not likely to adversely affect critical habitat but remains unknown into the future. The potential for beneficial effects by improving species composition and biodiversity of flora to the ecosystem would contribute to the primary constituent elements related to aquatic and terrestrial habitat by reducing infestations of noxious weeds into these habitats. The treatment of these noxious and invasive weeds will be a negligible loss to existing habitat and will not result in a loss of Primary Constituent Elements in designated critical habitat. The application of any effective herbicide will damage at least some vegetation, and this damage may alter the suitability (either positively or negatively) of PCE in terms of habitat, microclimate, or food supply. Over the long term, control and eradication of noxious weeds will continue to maintain quality habitat of native flora for Yosemite toad. Furthermore PDF 33 provides opportunity for active restoration, replanting of native vegetation if applicable.

Cumulative Effects

The cumulative effects analysis area for the Yosemite toad is designated critical habitat within the Inyo NF plan area. This is an appropriate scale for determining cumulative effects since this area includes all suitable habitat potentially affected by implementation of the Proposed Action. The cumulative effects time frame is 15 years into the future. The cumulative effects of all past non-federal actions are incorporated into the existing condition.

The majority of the critical habitat for Yosemite toad on the Inyo NF occurs within designated wilderness. There is only one approximately 20 acre parcel of non-federal lands in the upper end of the Humphreys Basin/Seven Gables critical habitat unit that is privately owned. The uses on this parcel are unknown but it appears to be an old mining claim with no obvious surface activities.

Some non-federal future actions, such as those identified in the Cumulative Effects Common to All Species, may affect these species and their habitats in the plan area, such as fish stocking by CDFW. However, fish stocking was evaluated in 2010 by the CDFW and stocking near locations of federally listed species, including the Yosemite toad was discontinued in or near occupied locations (ICF Jones & Stokes 2010).

Non-native invasive species have prolific seeding rates that quickly colonize in disturbed settings. Wildfire events, in particular, can pose the highest risk for weed spread with bare ground, high nutrient availability and a lack of competing plants. Treatments of newly discovered (currently unmapped) infestations or species of invasive plants would occur according to the Early Detection Rapid Response (EDRR) approach, which is designed to allow for control of new invasive plant infestations as soon as possible after their detection. EDRR treatments could occur outside of currently mapped areas, but treatments in these areas would be subject to an Annual Implementation Process.

Given these and other potential nonfederal future actions, we do not anticipate a significant increase in the level of impacts to these species' population in the plan area beyond what has already been noted in the analysis of effects resulting from implementing the Proposed Action.

Determination

Key conclusions:

- Of the 16 Yosemite toad critical habitat units, five are located on the Inyo NF, covering approximately 83,939 acres of which 0.002% account for 2 known weed locations total acreage (1.37 ac). Containing and or treating each site would account for *0.003% of CHU #5 and 0.004% of CHU 13 total area.*
- Relocating of individuals to a safe location away from treatment activities is likely to occur and would be considered harassment.
- Tarping may be required in the future and may incidentally trap a burrowing toad.
- Given the limited amount of currently known acreage within critical habitat and proposed treatment priorities and strategies (appendix D), as well as the limited vectors, resilient habitat, and high-elevation environmental conditions (lead to low likelihood of future introductions) we expect future levels of infestations to be similar, but remains unknown into the future therefore impacts to PCE are possible.

- Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.
- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- The following Project Design Features for Federally Threatened or Endangered Amphibians (Sierra Nevada yellow-legged frog (SNYLF), northern (DPS) Mountain Yellow-Legged Frog (MYLF) and Yosemite Toad (YT)) will apply:

17. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within SNYLF, MYLF or YT designated critical habitat or within 500 feet of known occurrences. Treatment strategies in these areas, including applying buffers, limited operating periods, and relocating individual amphibians, will be developed collaboratively on an annual basis by the Noxious Weed Coordinator and the Forest Fisheries Biologist to ensure treatment efforts minimize impacts to frog and toad populations and critical habitat.

In occupied habitat the following restrictions apply:

20. Immediately prior to any treatment activities, a Forest Service biologist who is trained in identifying and handling rare amphibians will survey the area for SNYLF, MYLF and YT. If individuals are found they will be relocated to a safe location that is nearby but out of potential harm's way from treatment activities. In most cases this will be less than 100 feet from the original location of the amphibian.

21. Chemical treatments within 50 feet of active breeding locations for SNYLF, MYLF and YT would be limited to direct foliar, spot spray, or hand application of glyphosate, imazapyr, or triclopyr-TEA until after metamorphosis has occurred. Metamorphosis typically occurs around July 31st and will be confirmed with a site-specific survey prior to treatment.

Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by weed activities, adoption of the Proposed Action *may affect, likely to adversely affect* the Yosemite toad.

Since a small portion of critical habitat exists outside of wilderness and weed management could occur there and modified primary constituent that elements therefore we determine that adoption of the Proposed Action *may affect, likely to adversely affect designated critical habitat* of the Yosemite toad on the Inyo National Forest.

Lahontan Cutthroat Trout

The Lahontan cutthroat trout (LCT) Recovery Plan (United States Department of the Interior 1995a) and latest 5-Year Review (United States Department of the Interior 2009a) describes key habitat, life history requirements, distribution and threats compiled from a variety of best available science sources. The relevant information is summarized here, generally without the specific source attributions, except where other sources are used or where it may aid in identifying which document contains additional detail.

Classification, Critical Habitat and Recovery Plan

Lahontan cutthroat trout was listed as endangered in 1970 (United States Department of the Interior 1970), but was subsequently reclassified as threatened in 1975 to facilitate management and allow regulated angling (United States Department of the Interior 1975). Critical habitat has not been designated for this species. There is one “out-of-basin” population on the Inyo NF. Out-of-basin populations are those located outside of the historical range of the species. The species is managed according to the Recovery Plan published in 1995 (United States Department of the Interior 1995b).

The Lahontan Cutthroat Trout Recovery Plan identified a criteria for delisting by population segment when management has been instituted to enhance and protect habitat required to sustain appropriate numbers of viable self-sustaining populations (United States Department of the Interior 1995b).

The 1995 recovery plan applies to the out-of-basin populations on the Inyo NF. Recovery Action 17 focuses on managing and monitoring the species in the out-of-basin locations so they have the potential to serve as donor stock for reintroduction within the historic range.

The 2009 5-Year status review recommended the following range-wide actions: revise the 1995 recovery plan; develop state and tribal hatchery management plans; improve utility of monitoring/accomplishment databases; and develop regulations to help conserve Lahontan cutthroat trout (United States Department of the Interior 2009a). The revision to the 1995 recovery plan not been formally initiated.

Habitat and Life History

The 5-Year Review (United States Department of the Interior 2009a) summarizes the habitat and life history of the Lahontan cutthroat trout. Optimal habitat is characterized by 1:1 pool-riffle ratios; well-vegetated, stable stream banks; over 25 percent cover, and relatively silt free rocky substrates. Lahontan cutthroat trout inhabits areas with overhanging banks, vegetation, or woody debris. In-stream cover (brush, aquatic vegetation, and rocks) is particularly important for juveniles. Lahontan cutthroat trout are unique since they can tolerate much higher alkalinities than other trout. Lahontan cutthroat trout have an optimal range in waters with average maximum water temperature of less than 72 degrees Fahrenheit and average daily summer water temperatures of 55 degrees Fahrenheit.

Some fluvial-adapted fish remain for 1 or 2 years in nursery streams before emigrating in the spring. Growth rates for stream dwelling Lahontan cutthroat trout are fairly slow. Stream-dwelling Lahontan cutthroat trout generally have a life span of less than 5 years, while those living in lakes may live 5 to 9 years. Fluvial Lahontan cutthroat trout are opportunistic feeders whose diets consist of drift organisms.

Historic and Current Distribution

The Recovery Plan describes the historic and current distribution (United States Department of the Interior 1995a). Prior to the 19th century, Lahontan cutthroat trout occurred in 11 lacustrine populations occupying about 334,000 acres of lakes and an estimated 400 to 600 fluvial populations inhabiting more than 3,600 miles of streams. Many of the basins in which cutthroat trout occur contain remnants of more extensive bodies of water which were present during the wetter period of the late Pleistocene epoch, 25,000 years ago. Lake Lahontan was one of these bodies of water that covered much of northwestern Nevada and parts of northern California and southeastern Oregon. Lahontan cutthroat trout historically occurred in most cold waters of the Lahontan Basin including the Humboldt, Truckee, Carson, Walker and Summit Lake/Quinn River drainages. These trout also occurred in Tahoe, Cascade, Fallen Leaf, Upper Twin, Lower Twin, Pyramid, Winnemucca, Summit, Donner, Walker, and Independence lakes.

Native Lahontan cutthroat trout are now extirpated from Cascade, Upper Twin, Lower Twin, Winnemucca, and Walker lakes. They have also been extirpated from most of the western portion of its range in the Truckee, Carson, and Walker river basins, and from much of its historic range in the Humboldt basin. Lahontan cutthroat trout currently exist in about 874 miles or 8.6 % of streams in 16 different hydrologic units within their historical range and additional 52 miles of habitat in 11 hydrologic units outside their historical range (Out-of_Basin) for a total of 640 miles of occupied stream habitat. Many of the fluvial populations occupy isolated stream segments of larger river systems with no opportunity for natural recolonization.

Recent genetic analyses have confirmed that the Lahontan cutthroat trout population on the Inyo NF was transplanted from Carson River populations (Peacock and Kirchoff 2007), the exact contributing location unknown. The fish were released into O’Harrel Creek, an approximately 2.0 mile dis-continuous stream within the Owens River watershed in the Crowley Lake area. The creek occurs on a south-facing alluvial fan that has been incised, creating a small stream within the incision. The LCT only occupy the upper half of the wetted channel. The only amount of suitable habitat where this out-of-basin population persist is contained within approximately 0.5 mile reach of stream with 0.2 miles of that occurring on LADWP land. In the 2001 Sierra Nevada Forest Plan Amendment. The 1,830 acre O’Harrel critical aquatic refuge was identified to protect habitat for this species (Figure 16). The stream does not connect with the main stem of the Owens River, which isolates the population from brown trout (*Salmo trutta*) and rainbow trout (*O. mykiss*). Extensive watershed repair and restoration has been implemented along O'Harrel Creek since the 1960’s. The last restoration effort in 1999 included installing sills along 1 mile of stream to raise the level of the stream within the incision and create plunge-pool habitat to increase habitat diversity within the stream. The sill installation showed some success, but some failed structures returned to pre-installment condition. Changing the grazing regime along this segment has had the most positive influence on riparian function by creating a dense vegetative component within the floodplain and stabilizing sediment deposited along the streambanks.

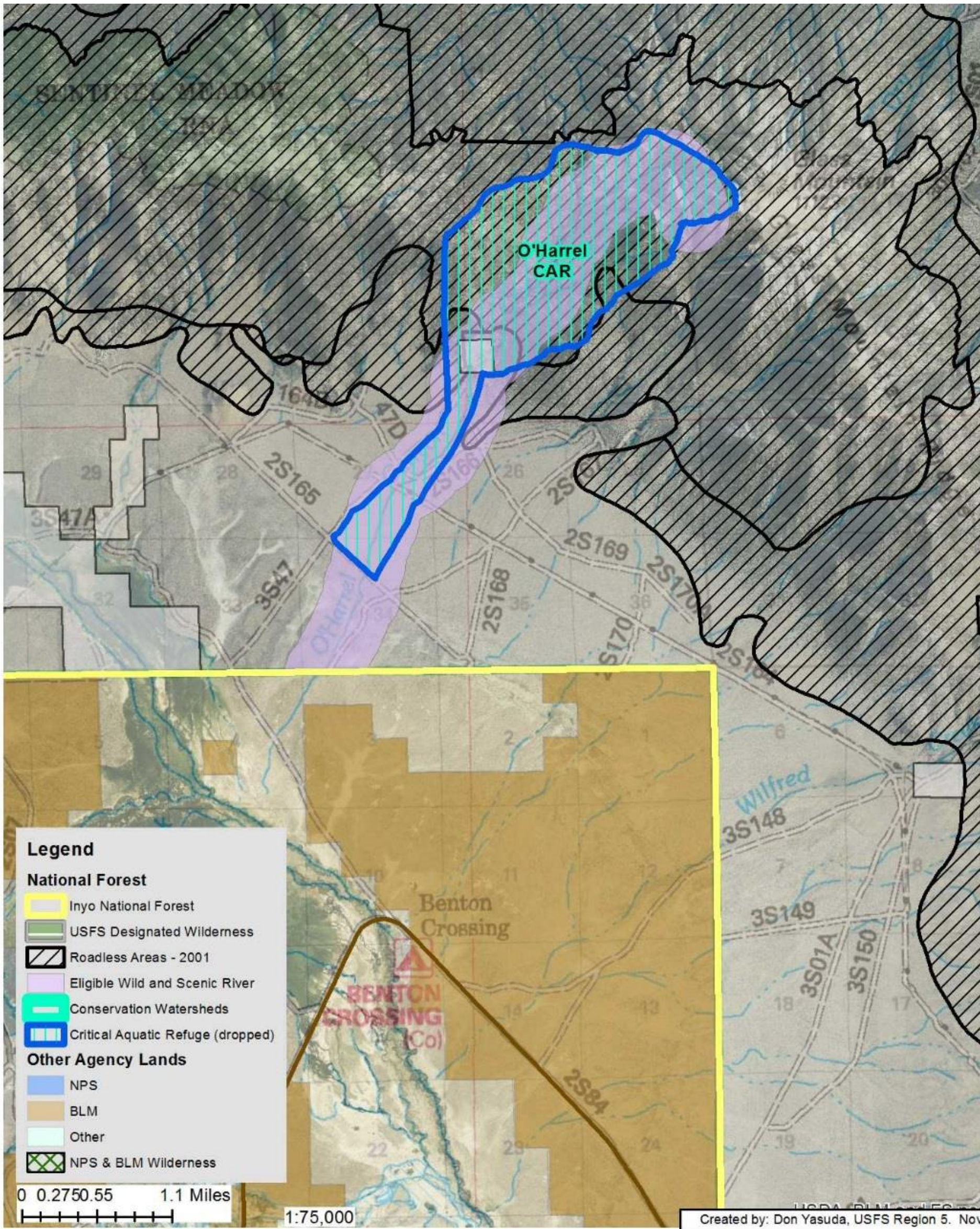


Figure 16 Map of Lahontan cutthroat trout critical aquatic refuge

Population and Habitat Status and Trends

The California Department of Fish and Wildlife monitors the population on the Inyo NF semi-annually using the Visual Encounter Survey protocol, validated by electroshocking every 5 to 10 years, when necessary. It is difficult to determine population trends from this limited annual survey data because population counts appear to fluctuate primarily due to water levels affected by climatic conditions such as snow pack and summer precipitation. A habitat restoration project to install log sills was implemented in 1999. The numbers of fish declined shortly after implementation of the structures, but numbers rebounded in 2005. The cause of the decline is unknown but it could possibly be accounted for by the late season timing of the survey when temperatures were high and fish may have retreated to other portions of the stream above the “campsite” (located on LADWP land) where water is typically cooler and shadier. O’Harrel Creek is the only habitat containing this species on Inyo NF and typically exceeds 80 degrees Fahrenheit in the summer, with temperatures recorded at 90 degrees Fahrenheit, limiting available habitat for the fish. Fish typically move upstream into the shady areas around the “campsite” location during these hot summer temperatures. In 2001 it was noted that many of the structures were failing; however, since then it

appears that many of the log sills may have been successful at increasing habitat availability as evidenced by the occurrence of pools occupied by Lahontan cutthroat trout. In November, 2011 an electroshocking survey was conducted by the CADFW and USFS with poor results: one 7.5 inch adult and four 3 inch sub-adults were recovered, without injury. All fish were retrieved just below the “campsite” area. It is assumed that the 560 acre “Oharrel” wildfire which occurred at the top of the O’Harrel watershed in 2007 contributed to a high volume of sediment that severely reduced the population. Fish were still observed in the stream during the springs of 2008 and 2009, but were difficult to find in 2010 and 2011. Photos from the area indicate an abundant sediment load after the 2010 spring run-off, indicating a lag in sediment movement after the wildfire. The electroshocking survey in 2011 confirmed the reduction in numbers of this population. No official surveys have been conducted since 2011, although casual observations of a few fish have been reported to the CDFW.

Lahontan cutthroat trout are managed by the State of California under the 4(d) rule published in 1975, which states that Lahontan cutthroat trout can be taken in accordance with applicable State law and that violation of State law will also be a violation of the Endangered Species Act (Code of Federal Regulations Title 50, Section 17.44). There are no special State angling regulations for O’Harrel Creek. Currently, the CDFW stocks Lahontan cutthroat trout into several lakes and rivers in the Sierra Nevada, including several lakes in Inyo and Mono Counties.

Threats

The severe decline in occupied range and numbers of Lahontan cutthroat trout in its endemic range is attributed to a number of factors including hybridization and competition with introduced trout species; alteration of stream channels and morphology; loss of spawning habitat due to pollution and sediment inputs from logging, mining, livestock grazing practices; urbanization; migration blockage due to dams; reduction of lake levels and concentrated chemical components in lakes; loss of habitat due to channelization; de-watering due to irrigation and urban demands; and overfishing (United States Department of the Interior 1995a). Within the out-of-basin population along O’Harrel Creek, the following are relevant threats to consider.

Loss of Habitat

Inyo NF only has the out-of-basin O’Harrel population, the primary threat to the population essentially is due to habitat that is primarily unsuitable for trout habitation. Streams on alluvial fans are subject to flashy flows and instability due to the alluvial nature of the substrate. Although much work has been completed within this channel to stabilize portions to create suitable habitat, portions of the stream are subject to low flows, high temperatures and constant re-location of the channel across the fan. Historic grazing in the area most likely created conditions that channelized the stream through the fan portion of the habitat, however, now this lower channel section is established and all occupied habitat is fenced and excluded from grazing. High volumes of sediment from the effects of wildfire, important for the geomorphology of alluvial fan development, are also a constant threat to the resident trout, as noted in the decline of population numbers above resulting from the 2007 “O’Harrel” fire.

Other Threats

Other threats include impacts from dispersed recreation activities which are actually very limited due to the remoteness of the site. Camping within the section of private land located at the middle of the available habitat. Since this activity occurs on private lands, it is outside the authority of the Inyo NF to manage.

Analysis of Effects

Current Noxious Weeds locations within Lahontan Cutthroat Trout Habitat:

Within the project area, there are currently zero mapped weed infestations, totaling approximately zero acres, within 300 feet and just to be sure 500 feet of an occupied stream for out-of-basin LCT (Table 14 and Figure 17).

Table 14 Acres of noxious weeds within 300 feet of occupied Lahontan cutthroat trout

INYO NF SITES	FS DISTRICT/ COUNTY	LCT OCCUPANCY STATUS	OCCUPIED CREEK MILES	WEED ACRES (within 300')	WEED SPECIES	TREATMENT METHOD
O'Harrel Canyon Creek	Mammoth RD/ Mono	Out-of-Basin Population	~0.5	0	0	N/A

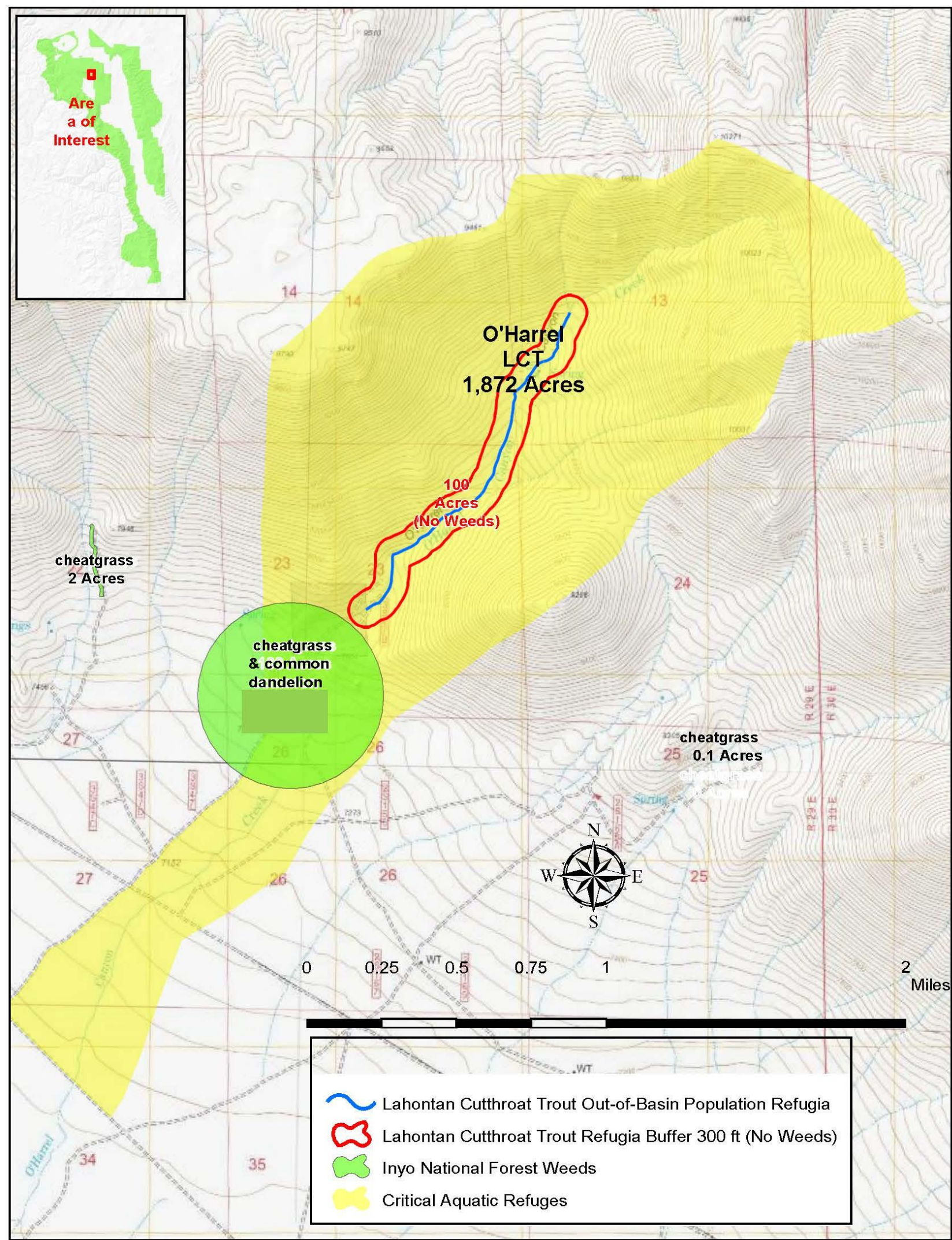


Figure 17 Lahontan Cutthroat Trout Out-of-Basin O'Harrel Population & Weed Locations

Although current weed infestations within 300' buffer are at zero the proximity of this LCT out-of-basin population is close enough to noxious weeds to pose a concern for future infestations and or wildfires. This site could be elevated in priority to prevent further spread and or eradicate.

Direct and Indirect Effects

Manual, Mechanical, Cultural, and Herbicide Treatments

Weed treatment occurring within known locations where water is expected would be limited to direction of application label as well as design feature buffers depending and time of year. Design feature to protect aquatic systems in treatment sites would be implemented to avoided critical periods for this trout. Human disturbance from weed treatments (including hand pulling) may encounter individuals and cause them to be disperse. However, this disturbance would be temporary, lasting only the day (or two) and would not result in any measurable impacts to the viability of individuals or the population. Herbicides used to control annual grasses, including clopyralid are used as a pre-emergents that are applied during the fall months. Non-native thistles and knapweeds would either be hand pulled or treated with an herbicide such as aminopyralid or chlorsulfuron. The ecological effects of the above herbicides as well as glyphosate, imazapyr, and triclopyr are further discussed in Herbicide Toxicity. There will be no direct or indirect impacts to this trout from the use of herbicides. SERA risk assessments were reviewed and indicate that at proposed application rates, the estimated doses from the exposure scenarios are all less than the reported NOAEL (no-observable adverse effect level) for all herbicides. There are no acute or chronic exposure scenarios

at application rates described in the Proposed Action that will result in a Hazard Quotient (HQ) above one for fish. Herbicides and surfactants applied as described in the Proposed Action pose no risk to these species. Under the Proposed Action, triclopyr will only be used in limited situations, primarily to treat woody species such as salt cedar tamarisk. Triclopyr is applied using hand application methods such as wick and wipe on individual plants or cut-stump application which will minimize the risk of non-target exposure and accidental drift.

There are no areas currently identified for tarping or mulching within this species habitat however the future may warrant this method. The greatest likelihood that tarping or mulching would be used on the Inyo NF would be when fire planning teams identify potential impacts from fire suppression activities that have a high likelihood for weed infestations on listed species habitat. For aquatic species these would be within riparian buffers where disturbance in and within proximity of noxious seed banks such as cheatgrass or Canada thistle. Misapplication in retardant avoidance zones could warrant any method in Proposed Action to be included in Repair Plans post fire. Future restoration projects with objective to remove weeds or suppress seed banks and restore the native flora diversity are likely to occur.

Biological Controls

If biological controls are determined to be an appropriate treatment method, there will be no measurable effects to trout or their habitat. Under the Proposed Action, only biological control agents that are permitted for release by the USDA Animal Plant Health Inspection Service (APHIS) and the California Department of Food and Agriculture (CDFA) will be used. Before being permitted by APHIS and CDFA, these insects must undergo considerable testing and meet other strict criteria prior to their release to ensure they will not pose a threat to non-target species (CDFA 2018). By utilizing only federally and state approved insects to control noxious weeds, the risk for inadvertent harm to native vegetation in the project area is minimal.

As described in the Effects Common to Habitats and Species, eliminating weeds indirectly contributes to riparian conservation areas objectives to provide beneficial functions such as providing cold, clean water; stream shading; aquatic/riparian habitat for indicator; and nutrients. There are also many specific standards and guidelines that would avoid, mitigate, or minimize certain types of activities or intensities or magnitudes of effects within riparian conservation areas and to riparian resources. These plan components collectively help assure stream and riparian habitats are conserved and restored for long-term sustainability and resilience, and species long-term viability.

There will be no negative impacts to habitat for Lahontan cutthroat trout under the proposed action. The treatment of these noxious and invasive weeds will be a negligible loss to existing habitat and will not impact this species. Over the long term, control and eradication of noxious weeds will help maintain quality habitat for Lahontan cutthroat trout.

Determination

Key conclusions:

- Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.
- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- The following Project Design Features will apply:
 - 22. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within 300 feet of occupied LCT, PCT, and Owen’s tui chub streams, to ensure treatments follow design features outlined below.
 - 23. Chemical treatments within 50 feet of LCT, PCT, and Owen’s tui chub occupied habitat, would be limited to application (direct foliar, spot spray, had application) of glyphosate, imazapyr, triclopyr-TEA.

Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by future restoration activities, adoption of the Proposed Action *may affect, and is not likely to adversely affect* the Lahontan cutthroat trout.

Paiute Cutthroat Trout

The Paiute cutthroat trout Recovery Plan (United States Department of the Interior 2004) and 5-Year Review (United States Department of the Interior 2013b) describes key habitat, life history requirements, distribution and threats compiled from a variety of best available science sources. The relevant information is summarized here, generally without the specific source attributions, except where other sources are used or where it may aid in identifying which document contains additional detail.

Classification, critical habitat and Recovery Plan

The Paiute cutthroat trout was originally listed as endangered in 1967 (United States Department of the Interior 1967) but was subsequently reclassified as threatened in 1975 to facilitate management and allow regulated angling (United States Department of the Interior 1975). Critical habitat for this species has not been designated. A Recovery Plan for the Paiute cutthroat trout was developed in 1985, and revised in 2004 (United States Department of the Interior 2004). The most recent 5-Year Review was completed in 2013 (United States Department of the Interior 2013b).

The objective of the 2004 Recovery Plan (United States Department of the Interior 2004) is to improve the status and habitat of Paiute cutthroat trout and eliminate competition from nonnative salmonid species. Recovery Plan actions relevant to the Inyo NF include: Recovery Action 3 - Protect and enhance all occupied Paiute cutthroat trout habitat; Recovery Action 4 - Continue to monitor and manage existing and reintroduced populations; Recovery Item 5 - Develop a long-term conservation plan and conservation agreement; and Recovery Item 6 - Provide public information.

Habitat and Life History

The 5-Year Review (United States Department of the Interior 2013b) summarizes the habitat and life history of the Paiute cutthroat trout. There have been few studies on the biology of Paiute cutthroat trout. It is thought that life history and habitat requirements are similar to other western trout, such as cool, well-oxygenated water for all life stages. They are obligatory stream spawners and adult fish are noted as preferring pool habitat in low gradient meadows with undercut or overhanging banks and abundant riparian vegetation.

They feed on drift organisms, both terrestrial and aquatic insects. Natural predators noted for Paiute cutthroat trout eggs and fry are water shrews (*Sorex palustris*); dippers (*Cinclus mexicanus*); trichopteran larvae; and caddis fly larvae but adults have few predators. Disease may be a significant factor in adult mortality, especially post-spawning, as evidenced in the North Fork of Cottonwood Creek population (United States Department of the Interior 2013b).

Paiute cutthroat trout have a distinctive evolutionary history that complicates management efforts to recover this fish. Paiute cutthroat trout evolved in isolation from other fish species, and accordingly faced substantially different selection pressures than most other North American salmonids. This subspecies has behavioral traits that make coexisting with potential competitors highly unlikely. The Paiute cutthroat trout is eventually displaced when other salmonids invade their habitats through introgressive hybridization or competition. Similar to many subspecies of cutthroat trout, Paiute cutthroat trout are vulnerable to angling and their unwariness makes them susceptible to population declines with even light fishing pressure.

Historic and Current Distribution

The Paiute cutthroat trout became isolated from the Lahontan cutthroat trout during the last 10,000 years by a series of physical barriers in Silver King Creek. The presumed historic distribution of the Paiute cutthroat trout is limited to 11.1 miles of habitat in Silver King Creek and reaches of small connected tributaries on the Humboldt-Toiyabe NF but there is a lack of early records and confusion related to unofficial transplants (United States Department of the Interior 2013b).

The Inyo NF supports two of the four self-sustaining out-of-basin stream populations (located outside of the historical range of the species) identified in Figure 18: North Fork Cottonwood Creek and Cabin Creek in the White Mountains (United States Department of the Interior 2013b). In 1946, Paiute cutthroat trout from the Silver King Creek drainage were stocked into the North Fork of Cottonwood Creek. Cabin Creek was originally stocked in 1968 with individuals from the North Fork of Cottonwood Creek. Both of these populations are within the White Mountain Wilderness and both populations are established and reproducing. The other two current out-of-basin populations are in streams located on the Sierra NF and are not considered in this biological assessment.

The North Fork of Cottonwood Creek is a small, spring-fed brook that originates on the east slope of Paiute Mountain. It flows southeasterly for approximately 4.5 miles before merging with the South Fork to form Cottonwood Creek. Only one major tributary, Tres Plumas Creek, enters the North Fork of Cottonwood Creek approximately 1.0 mile above its mouth. Occupied habitat in the North Fork of Cottonwood Creek is limited to the uppermost 3.4 miles of stream above a 7 foot tall barrier that is located just above the confluence with Tres Plumas Creek. In the 2001 Sierra Nevada Forest Plan Amendment, the 28,770 acre Cottonwood Creek critical aquatic refuge was identified to protect habitat for this species. The occupied area is within the Cottonwood Creek Wild and Scenic River which was designated in 2009.

Occupied habitat in Cabin Creek is approximately 1.5 miles of stream habitat. Subsequently, fish have migrated downstream from Cabin Creek into Leidy Creek, which were observed during an electroshocking exercise in the fall of 2014 with CDFW and Nevada Department of Wildlife biologists. Leidy Creek became isolated from other down-stream, rainbow occupied streams when a diversion was installed, capturing all flows and effectively removing the threat of hybridization from downstream trout. Further investigation needs to be completed to determine if this newly established population is isolated from downstream trout and determine if additional management actions are necessary.

The Silver King Creek population declined dramatically during the 2013 to 2016 significant drought. In August of 2017, the North Fork Cottonwood Creek population was used as a source population to augment the existing population in Silver King Creek on the Humboldt-Toiyabe NF to ameliorate the effects from the drought.

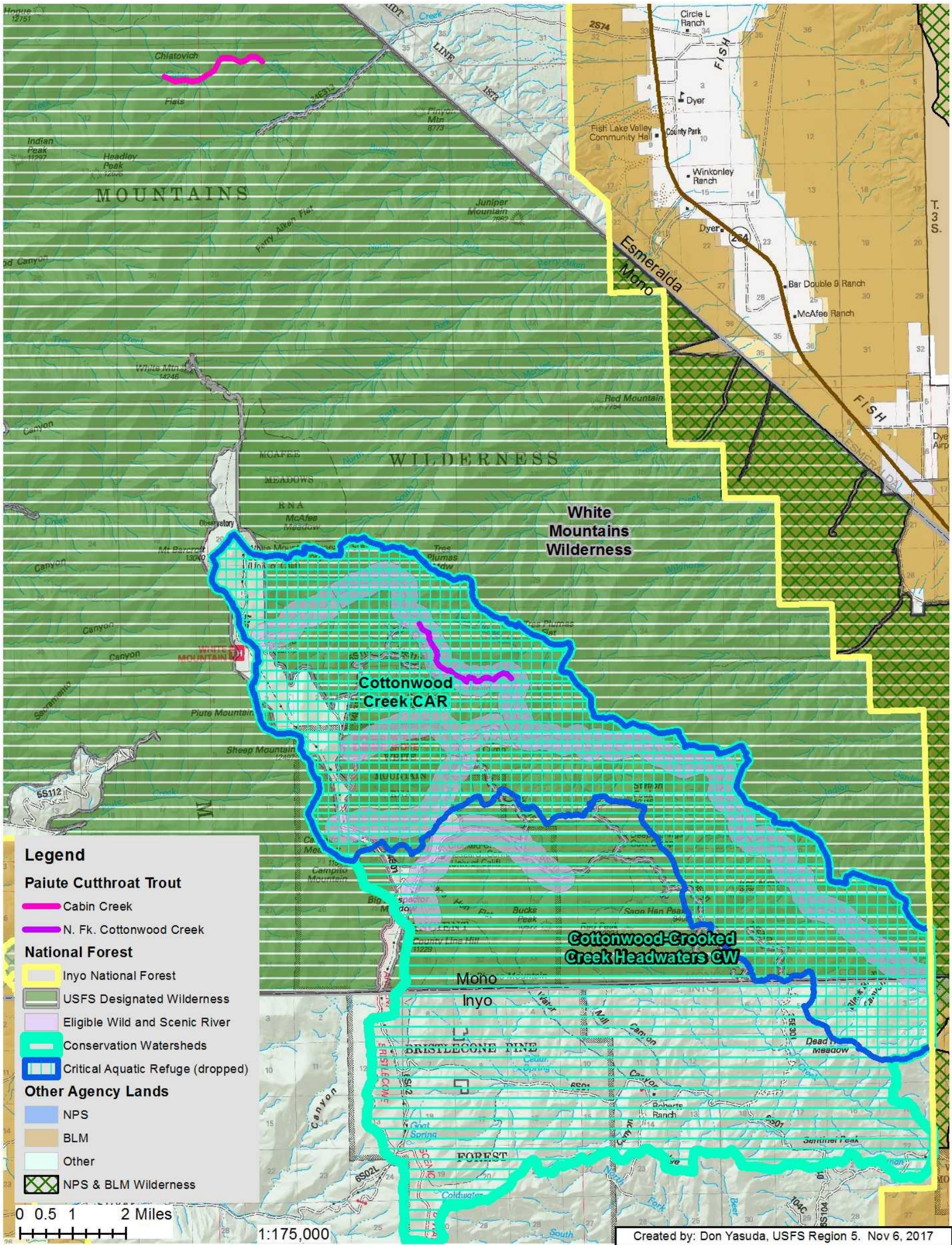


Figure 18 Locations of Paiute cutthroat trout Cabin & Cottonwood Creek

Population and Habitat Status and Trend

Endemic Paiute cutthroat trout habitat and the majority of the currently occupied streams are located in the Silver King Creek drainage on the Humboldt-Toiyabe NF and outside the boundaries of the Inyo NF.

The North Fork of Cottonwood Creek has been surveyed by the CDFW using visual surveys from Granite Meadow downstream to just above the Tres Plumas barrier since 1989 (United States Department of the Interior 2013b). These visual surveys indicate a stable population, with numbers ranging from 150 observed in 1986, to over 200 fish from 1996 through 2004, and 120 fish observed in 2005 (United States Department of the Interior 2008b). The exclusion of grazing since 1993 and spawning enhancement projects in 1995 and 1996, which created 51 spawning sites, appear to have increased Paiute cutthroat trout numbers (United States Department of the Interior 2004). More recent gravel enhancement work in 2007, prompted by the depressed population estimates in 2005, also created additional spawning sites throughout the 3 miles of habitat.

A fungal infection has been observed on the dorsal and caudal fins of spawned-out fish in the North Fork of Cottonwood Creek which has resulted in post-spawning mortality. The population level effects are unknown since the disease has been known since the early 1970’s but the population continues to exist.

Visual surveys were conducted on Cabin Creek in 1995, 2000, and 2009 but no trend was determined. In 1995, 139 fish were observed and in 2000, 186 fish were observed. Fish were also observed throughout the stream during a survey attempt in 2009 but no numbers were recorded due to time constraints and heavy willow growth (United States Department of the Interior 2013b). CDFW attempted to develop a population index for the North Fork of Cottonwood Creek Paiute cutthroat trout population due to high electrofishing mortality and injury rates compared to other cutthroat trout populations. It is possible the high mortality rates had to do with the elevated pH of the stream, but the reason is ultimately unknown.

Paiute cutthroat trout are managed by the State of California under the 4(d) rule published in 1975, which states that Paiute cutthroat trout can be taken in accordance with applicable State law and that violation of State law will also be a violation of the Endangered Species Act (Code of Federal Regulations Title 50, Section 17.44). Angling closures have also been established to protect the populations in the North Fork of Cottonwood Creek. The Cabin Creek population is relatively inaccessible and lightly used and is managed as a wild trout fishery without special protective regulations.

Threats

The Recovery Plan (United States Department of the Interior 2004) and subsequent 5-Year Review (United States Department of the Interior 2013b) was reviewed and three threats in the five-factor analysis were determined to be of higher concern to Paiute cutthroat trout and its habitat relevant to the plan area.

Destruction or modification of habitat

Nonnative fish pose a threat, primarily from hybridization that can result in loss of available habitat or range restrictions. Nonnative rainbow trout are present downstream of these two populations but are currently isolated by barriers: a natural barrier for the North Fork of Cottonwood Creek and an artificial barrier for Cabin Creek.

There are threats of population isolation and habitat fragmentation due to limited stream extents for these two locations. Neither of these populations meet long-term persistence criteria for the minimum amount of stream habitat thought to be necessary to sustain at least 2,500 individuals. The North Fork of Cottonwood Creek has *approximately 3.4 miles of* occupied habitat and Cabin Creek has approximately 1.5 miles of occupied habitat which are less than the 5.8 miles of stream habitat estimated to provide for persistence.

Historically livestock grazing (both cattle and sheep) occurred over much of the high Sierra Nevada mountain range, wherever forage was available. Grazing of livestock is noted as having potential to degrade habitat for Paiute cutthroat trout.

Considerable effort in the 1990’s was put into reducing sediment input into the North Fork of Cottonwood Creek, along with the suspension of grazing in the Cottonwood Creek and Tres Plumas Allotments in 2000. The grazing allotments are in non-use status but are not closed. If stream and riparian conditions can be maintained or continue to improve, future use of the allotments could be considered but this would require a site-specific analysis that would require consultation under the ESA. The removal of livestock has resulted in stabilized streambanks and the re-establishment of willows; however, spawning substrate is still a limiting factor in this high elevation, dolomitic-dominate landscape.

Cabin Creek is a remotely located stream in the White Mountain Wilderness at elevations above 11,000 feet. Cabin Creek is located within the Cabin Creek Allotment and grazing was authorized in the allotment in 2010 as a continuation of the grazing permit and is covered under Biological Opinion File No. 84320-2010-F-0088, dated June 1, 2010, by the Reno Field Office of the US Fish and Wildlife Service. However, the Cabin Creek area has not been grazed since 2005 due to restrictions in timing that is not compatible with the current grazing operation.

Other Natural or Manmade Factors

Increases in water temperature as a result of increased summer air temperature and changes in precipitation affecting streamflow could increase stress levels which may increase the susceptibility to disease. Since a fungal disease already exists within the North Fork of Cottonwood Creek population, if stress levels increase, it could result in higher levels of post-spawning mortality which could affect the persistence of the population.

There is a risk of adverse effects if wildfires burn outside of the characteristic fire regime and affect occupied habitat because there are no opportunities for recolonization if the entire occupied segment is affected. Cottonwood Creek is a narrow boulder canyon with few signs of single tree lightning strikes. North facing trees are widely spaced on the steep rocky slope. The opposite side is riparian vegetation then sage brush that is not likely to carry fire. Willows were planted following changes in grazing management and are well established in the creek and have enough dead woody debris to provide fuel. In 2017 the willow recruitment was separated by unoccupied sections reducing the risk for fire to carry throughout the entire riparian of the North Fork of Cottonwood Creek.

Analysis of Effects

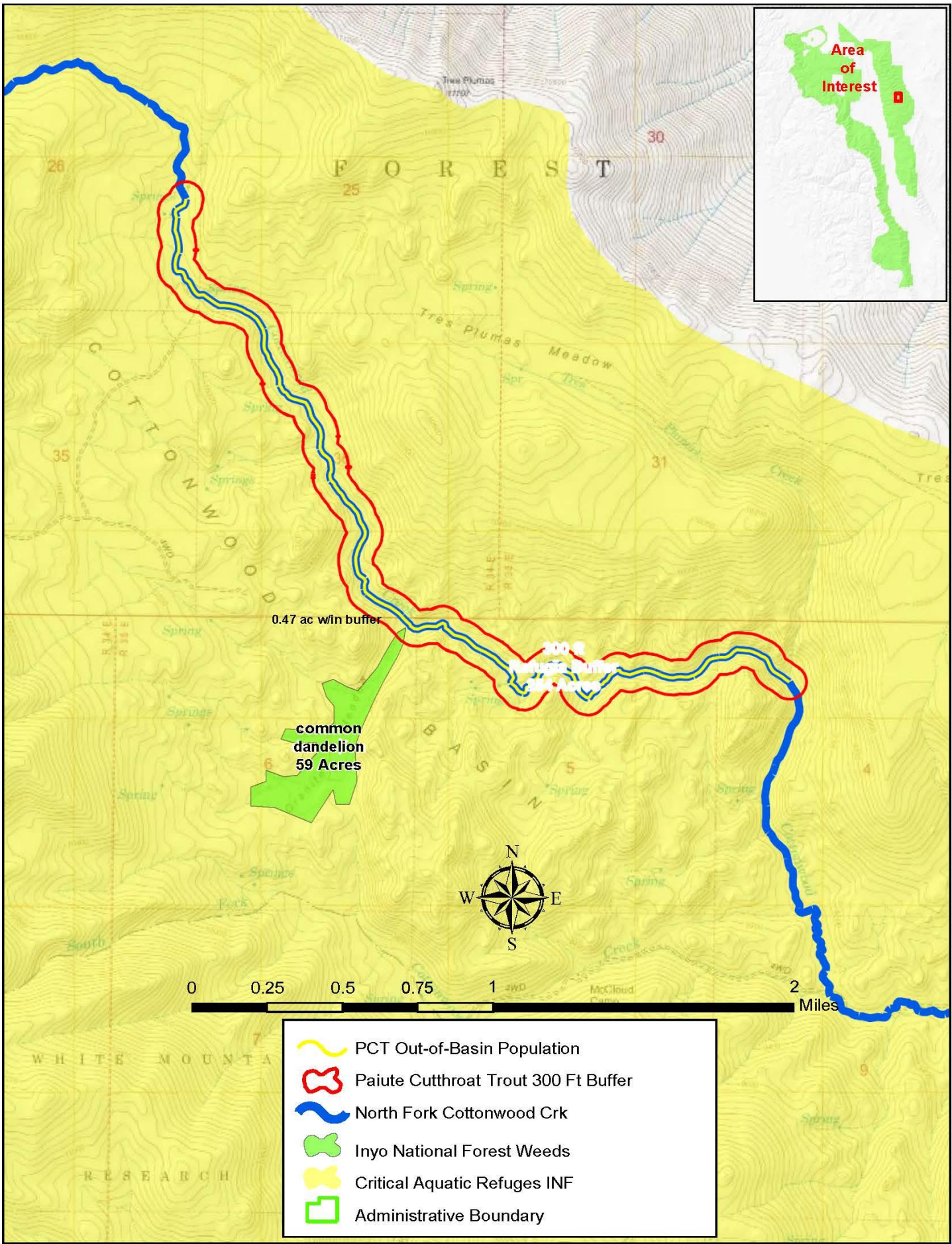
Current Noxious Weeds Locations within Paiute Cutthroat Trout Habitat:

Within the project area, there are currently one mapped weed infestations, totaling approximately 0.47 acres, within 300 feet of an occupied stream for out-of-basin PCT (Table 15 and Figure 19).

Table 15 Acres of noxious weeds within 300 feet of occupied Piute Cutthroat trout

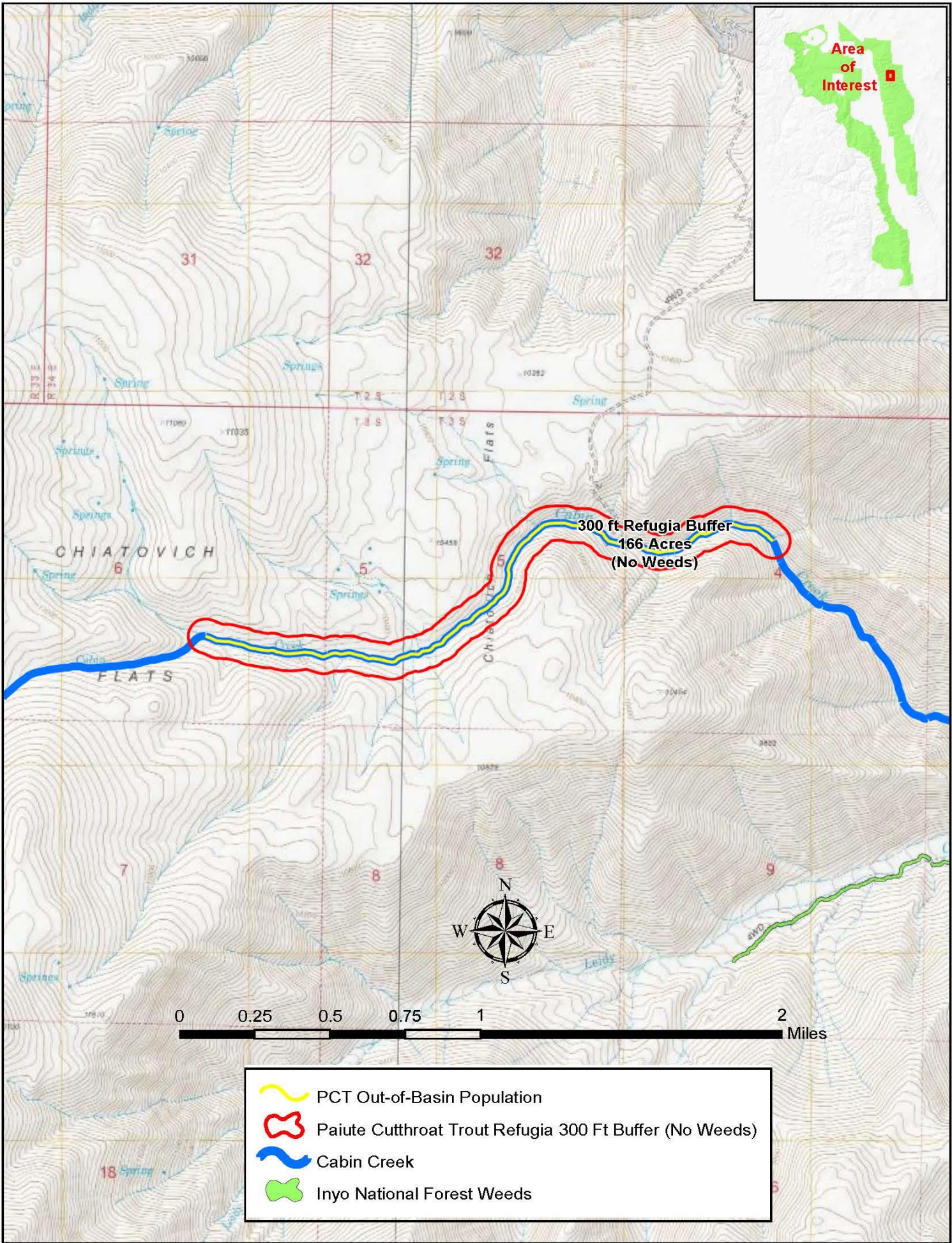
INYO NF SITES	FS DISTRICT/ COUNTY	PTC OCCUPANCY STATUS	OCCUPIED CREEK MILES	WEED ACRES (within 300')	WEED SPECIES	TREATMENT METHOD
North Fork of Cottonwood Creek (White Mtn Wilderness)	White Mountain RD/	Out-of-Basin Population	3.4	<0.47	Common Dandelion	#4 Limited/No Treatment
Cabin Creek (White Mtn Wilderness)	White Mountain RD/	Out-of-Basin Population	1.5	0	N/A	N/A

Figure 19 Paiute Cutthroat Trout Out-of-Basin N. Fork Cottonwood Cr Population & Weed Locations



Treating Cottonwood Creek site for PCT habitat improvement would consider several factors including the rate of spread, potential for ecological negatively impact native flora species, and among other things the potential for irradiation success. Infestations in special status areas, such as listed species habitat, can be elevated in priority for treatment. As indicated in Appendix D common dandelion treatments can include; hand pull, dig, cut, and glyphosate. Dandelions sites are often an over estimation of occurrence because the footprint is not continuous. This area will continue to be monitored and dandelions may receive treatments but there is a low likelihood for success of complete irradiation. The mapped portion within the 300 foot buffer equals 0.47 acres and may be tangible for treatment. There are no known noxious weed populations documented at Cabin Creek (Figure 20)

Figure 20 Paiute Cutthroat Trout Out-of-Basin Cabin Cr Population & Weed Locations



Direct and Indirect Effects

Manual, Mechanical, Cultural, and Herbicide Treatments

Weed treatment occurring within known locations where water is expected would be limited to direction of application label as well as design feature buffers depending and time of year. Design feature to protect aquatic systems in treatment sites and limiting operating periods would be implemented to avoided critical periods for this trout. Human disturbance from weed treatments (including hand pulling) may encounter individuals and cause them to be disperse. However, this disturbance would be temporary, lasting only the day (or two) and would not result in any measurable impacts to the viability of individuals or the population. Herbicides used to control annual grasses, including clopyralid are used as a pre-emergents that are applied during the fall months. Non-native thistles and knapweeds would either be hand pulled or treated with an herbicide such as aminopyralid or chlorsulfuron. The ecological effects of the above herbicides as well as glyphosate, imazapyr, and triclopyr are further discussed in Herbicide Toxicity. There will be no direct or indirect impacts to this trout from the use of herbicides. SERA risk assessments were reviewed and indicate that at proposed application rates, the estimated doses from the exposure scenarios are all less than the reported NOAEL (no-observable adverse effect level) for all herbicides. There are no acute or chronic exposure scenarios at application rates described in the Proposed Action that will result in a Hazard Quotient (HQ) above one for fish. Herbicides and surfactants applied as described in the Proposed Action pose no risk to these species. Under the Proposed Action, triclopyr will only be used in limited situations, primarily to treat woody species such as salt cedar tamarisk. Triclopyr is applied using hand application methods such as wick and wipe on individual plants or cut-stump application which will minimize the risk of non-target exposure and accidental drift.

There are no areas currently identified for tarping or mulching within this species habitat however the future may warrant this method. The greatest likelihood that tarping or mulching would be used on the Inyo NF would be when fire planning teams identify potential impacts from fire suppression activities that have a high likelihood for weed infestations on listed species habitat. For aquatic species these would be within riparian buffers where disturbance in and within proximity of noxious seed banks such as cheatgrass or Canada thistle. Misapplication in retardant avoidance zones could warrant any method in Proposed Action to be included in Repair Plans post fire. Future restoration projects with objective to remove weeds or suppress seed banks and restore the native flora diversity are likely to occur.

Biological Controls

If biological controls are determined to be an appropriate treatment method, there will be no measurable effects to trout or their habitat. Under the Proposed Action, only biological control agents that are permitted for release by the USDA Animal Plant Health Inspection Service (APHIS) and the California Department of Food and Agriculture (CDFA) will be used. Before being permitted by APHIS and CDFA/NDA, these organisms undergo considerable testing and meet other strict criteria prior to their release to ensure they will not pose a threat to non-target species (CDFA 2018). The risk for inadvertent harm to native flora and fauna in the project area is expected to be minimal because by utilizing only federally and state approved insects to control noxious weeds adds another layer of assurance and presumed adherence to state and federal laws including the Endangered Species Act. As described in the Effects Common to Habitats and Species, eliminating weeds indirectly contributes to riparian conservation areas objectives to provide beneficial functions such as providing cold, clean water; stream shading; aquatic/riparian habitat for indicator; and nutrients. There are also many specific standards and guidelines that would avoid, mitigate, or minimize certain types of activities or intensities or magnitudes of effects within riparian conservation areas and to riparian resources. These plan components collectively help assure stream and riparian habitats are conserved and restored for long-term sustainability and resilience, and species long-term viability. There will be no negative impacts to habitat for trout under the Proposed Action. The treatment of noxious and invasive weeds will be a negligible loss to existing habitat and will not impact this species. Over the long term, control and eradication of noxious weeds will help maintain quality habitat for Paiute cutthroat trout.

Cumulative Effects

The cumulative effects analysis area for the Paiute cutthroat trout is the Inyo NF plan area in the vicinity of North Fork of Cottonwood Creek and Cabin Creek. This is an appropriate scale for determining cumulative effects since this area includes all suitable habitat for these out-of-basin populations potentially affected by implementation of the Proposed Action. The cumulative effects time frame is 15 years into the future. The cumulative effects of all past non-federal actions are incorporated into the existing condition.

There are no known or foreseeable non-federal actions that would affect habitats or individuals other than continued monitoring and management of Paiute cutthroat trout by the CDFW in support of Recovery Action 4. Given this, we do not anticipate a significant increase in the level of impacts to these species’ population in the plan area beyond what has already been noted in the analysis of effects resulting from implementing the Proposed Action.

Determination

Key conclusions:

- Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.
- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- The following Project Design Features will apply:
 - 23. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within 300 feet of occupied LCT, PCT, and Owen’s tui chub streams, to ensure treatments follow design features outlined below.
 - 24. Chemical treatments within 50 feet of LCT, PCT, and Owen’s tui chub occupied habitat, would be limited to application (direct foliar, spot spray, had application) of glyphosate, imazapyr, triclopyr-TEA.

Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by future restoration activities, adoption of the Proposed Action *may affect, and is not likely to adversely affect* the Paiute cutthroat trout.

Owens Tui Chub

The Owens Basin Wetland and Aquatic Species Recovery Plan (United States Department of the Interior 1998) and 5-Year Review (United States Department of the Interior 2009c) describes key habitat, life history requirements, distribution and threats for Owens tui chub (OTC) compiled from a variety of best available science sources. The relevant information is summarized here, generally without the specific source attributions, except where other sources are used or where it may aid in identifying which document contains additional detail.

Classification, Critical Habitat and Recovery Plan

The Owens tui chub was listed as endangered and critical habitat was designated in 1985 (United States Department of the Interior 1985). Designated critical habitat in proximity to the Inyo NF includes portions of the Owens River Gorge and the springs and outflow channels at the Hot Creek Hatchery, which fall within private owned land within the Inyo NF administrative boundary (Figure 21). The Hot Creek critical habitat is mapped only on private lands and extends up to the forest boundary but no critical habitat occurs on the Inyo NF. A small portion of the settling ponds of the Hatchery does extend on to the Forest but are not mapped as being critical habitat for the Owens tui chub occurs on lands managed by the Inyo NF and no critical habitat would be affected by the Proposed Action.

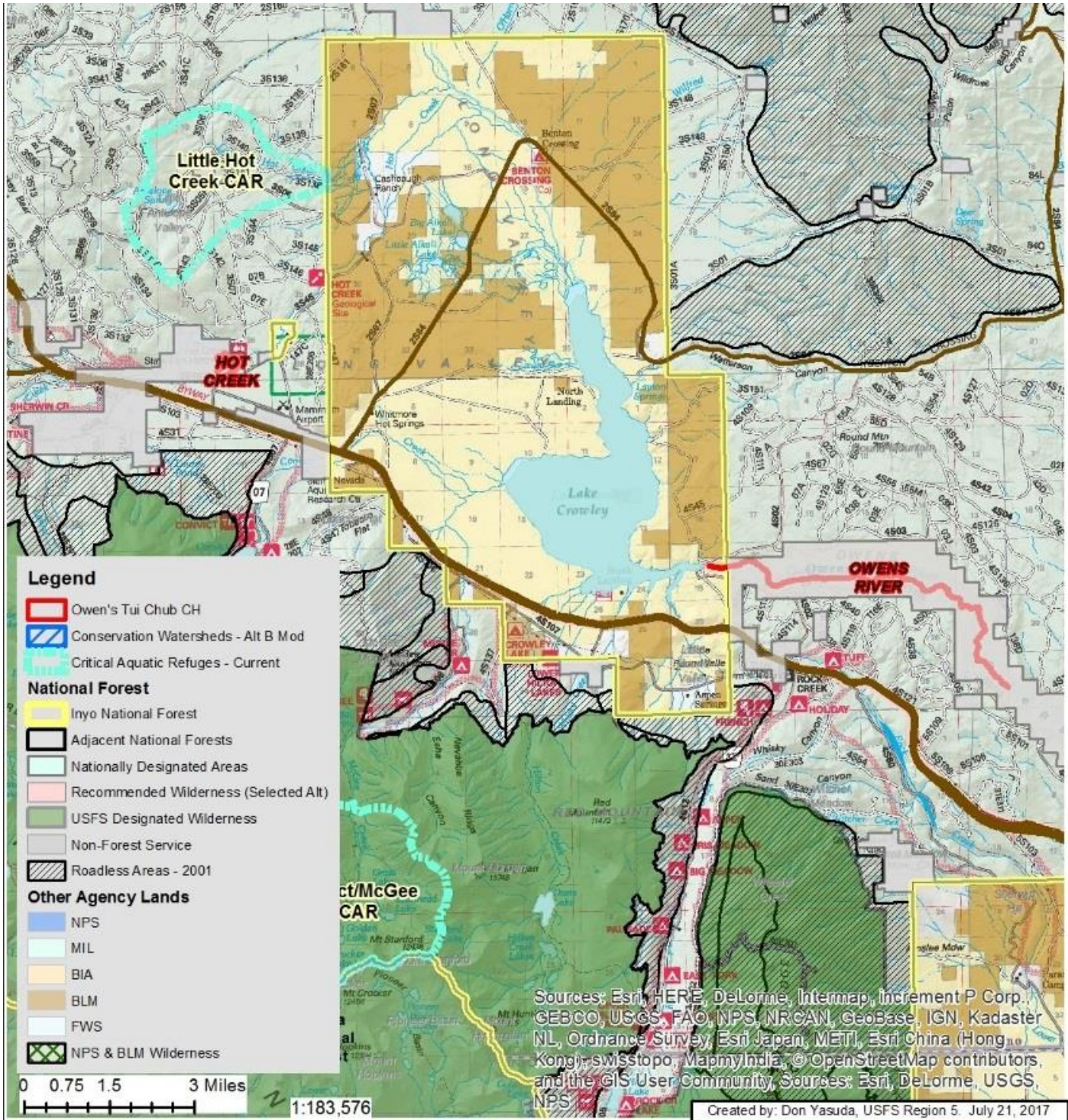


Figure 21 Owens tui chub critical habitat at Hot Creek and Owens River

The Recovery Plan (United States Department of the Interior 1998) states that the Owens tui chub will be considered for down-listing to threatened status when the following goals have been achieved (To date, none of the six criterion have been met.):

1. Reproducing and self-sustaining populations of the Owens tui chub must exist throughout six Conservation Areas. Two of the Conservation Areas must be in the Long Valley and four in the Owens Valley. The Conservation Areas are Little Hot Creek, Hot Creek, Fish Slough, Round Valley, Warm Springs, Blackrock, and Southern Owens.
2. Threats must be controlled.
3. Each Conservation Area must have an approved management plan and implementing agreement with the landowner and the Service.
4. Successful establishment of populations includes presence of juveniles and three additional age classes of Owens tui chubs.
5. Ensure that hybrid tui chubs do not occur in the Conservation Areas.
6. The biomass of the Owens tui chub must exceed the biomass of deleterious, non-native fish species at each site.

The Recovery Plan identifies the Little Hot Creek Conservation Area and the Hot Creek Conservation Area as important for recovery of the Owens tui chub (Figure 22). The Recovery Plan acknowledges the Sotcher Lake population of Owens tui chub but does not provide any direction on managing this area to contribute to the recovery of the species.

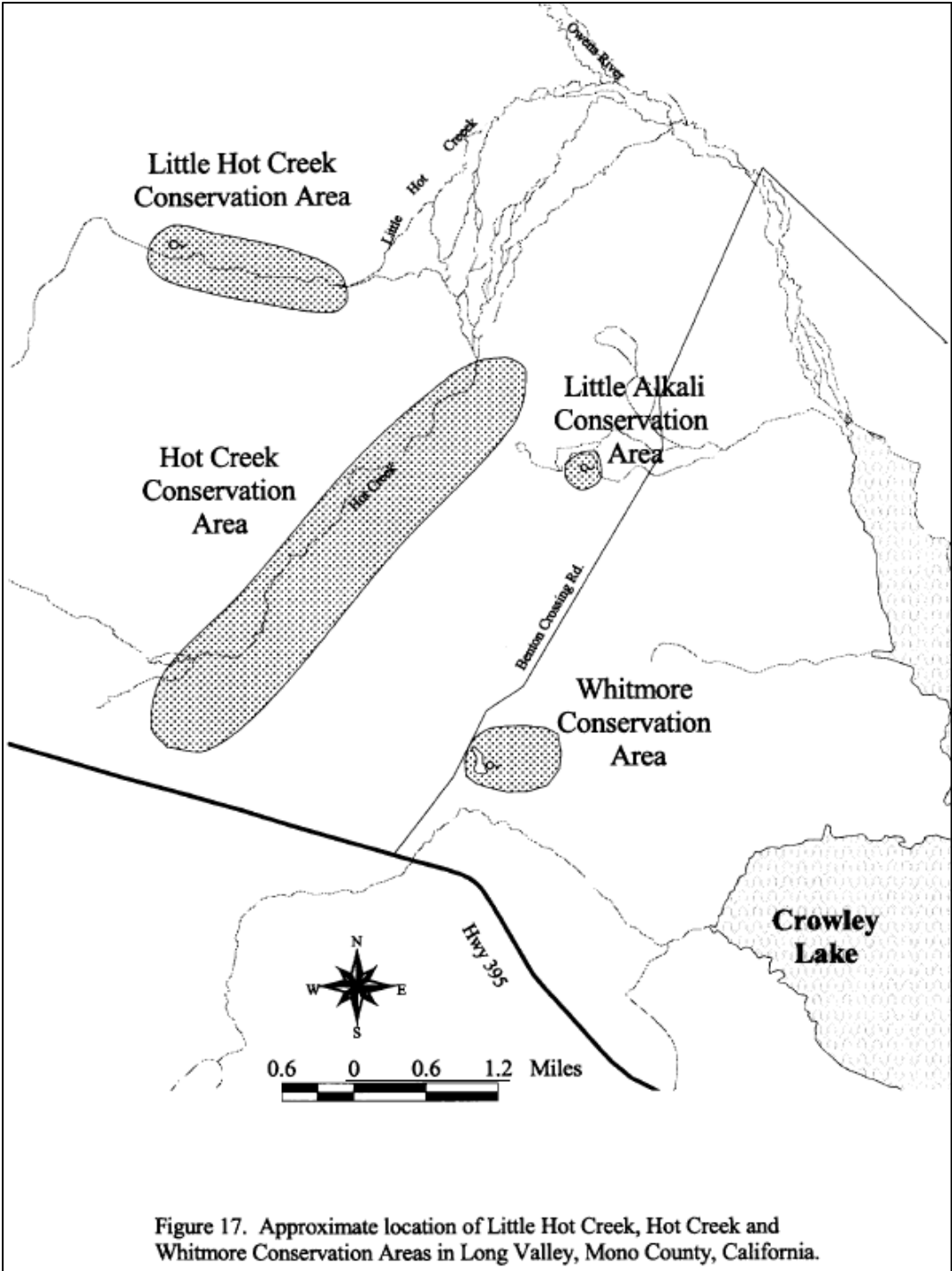


Figure 22 Conservation Areas identified for Owens tui chub in the Owens Basin Wetland Aquatic Species Recovery Plan (1998) relevant to the Inyo National Forest

The Recovery Plan lists the following tasks for the Little Hot Creek and Hot Creek Conservation Areas:

Recovery Plan Task 2.2. Little Hot Creek Conservation Area

Recovery actions in the Little Hot Creek Conservation Area should include expanding Owens tui chub habitat, eliminating non-native fishes and installing a fish barrier to prevent upstream movement into Little Hot Creek, protecting spring discharge from adverse impacts of ground water pumping and geothermal development, protecting vegetation from excessive livestock grazing and restoring vegetation communities. Recovery tasks for the Little Hot Creek Conservation Area include:

Recovery Plan Task 2.2.1. Control deleterious non-native species that are detrimental to Owens Basin native fish. Barrier construction may be necessary to control their reintroduction.

Recovery Plan Task 2.2.2. Expand aquatic habitat and fish populations. Native fish populations should be expanded downstream to include all of the aquatic habitat suitable to native fish. Long Valley speckled dace should be introduced into this habitat.

Recovery Plan Task 2.2.3. Evaluate livestock grazing practices and modify as necessary. Livestock grazing may affect alkali ivesia populations and the quality of the aquatic habitat. Grazing practices should be modified and, eventually eliminated if necessary where livestock are changing vegetation structure and function or adversely affecting aquatic habitats or populations of rare plants and animals. Livestock management should be consistent with achieving and maintaining vegetation potential as described in the NRCS Ecological Site Descriptions, in the U.S. Bureau of Land Management’s Desired Plant Community Definitions, and Bureau of Land Management documents on riparian area proper functioning condition (United States Department of Interior 1993, 1995).

Recovery Plan Task 2.2.4. Protect spring discharge. Geothermal development in Long Valley may be altering aquifer dynamics. Springs supporting Little Hot Creek should be protected from adverse impacts of decreased discharge, and changes in the thermal and chemical characteristics of water. Monitoring programs should be initiated to determine characteristics (temporal, chemical, physical) of natural spring discharge, if spring discharge is being affected, and the location of activities causing adverse effects. Actions should be taken to protect discharge at 1998 levels.

Recovery Plan Task 2.4. Hot Creek Conservation Area

Recovery actions for the Hot Creek Conservation Area should rehabilitate and protect aquatic habitats, maintain spring discharge, and reintroduce endemic species. Recovery tasks for the Hot Creek Conservation Area include:

Recovery Plan Task 2.4.1. Expand native fish habitat and distribution. The Long Valley native fish assemblage should be reestablished in the Hot Creek drainage. Successful reestablishment of this assemblage is probably most feasible near headsprings where non-native deleterious fish species can be most easily managed.

Reestablishing native fish in the drainage will require preventing fish pathogens from affecting Hot Creek Hatchery fish by ensuring that they are absent in donor fish. Impacts of hatchery activities on native fish populations should be identified and mitigation programs implemented.

Recovery Plan Task 2.4.2. Protect spring discharge. Geothermal development and groundwater pumping in Long Valley may alter aquifer dynamics. Springs supporting Hot Creek should be protected from adverse impacts of decreased discharge, and changes in the thermal and chemical characteristics of water. Monitoring programs should be determine characteristics (temporal, chemical, physical) of natural spring discharge, if spring discharge is being affected, and the location of activities causing adverse effects. Actions should be taken to protect discharge at 1998 levels. Natural spring discharge should continue to be used as the source providing for natural and naturalized aquatic habitats in the Conservation Area.

Habitat and Life History

The 5-Year Review (United States Department of the Interior 2009c) summarizes the habitat and life history of the Owens tui chub. It explains that the Owens tui chub evolved in the Owens River watershed with only three other smaller species of fishes, Owens pupfish (*Cyprinodon radiosus*), Owens speckled dace (*Rhinichthys osculus* ssp.), and Owens sucker (*Catostomus fumeiventris*) and with no aquatic predators. Little is known about the life history of the Owens tui chub, but it is thought to have similar requirements as other subspecies of tui chubs. The Owens tui chub prefers low velocity waters found in portions of the Owens River, associated tributaries, springs, sloughs, drainage ditches, and irrigation canals. Habitat includes waters with dense aquatic vegetation for cover.

Historic and Current Distribution

The Recovery Plan describes the historic distribution of the Owens tui chub by stating that the Owens tui chub is endemic to the Owens Basin (Owens Valley, Round Valley, and Long Valley) of Inyo and Mono Counties, California (United States Department of the Interior 1998). It explains that historically, the Owens tui chub occurred in large numbers in suitable habitat throughout the Owens Basin, including the Owens River and associated tributaries, springs, drainage ditches, and irrigation canals and was common in the Owens Valley floor from the late 19th to early-to-mid 20th centuries. However, when the official scientific description of the subspecies was published in 1973, the population size and range of the Owens tui chub had been drastically reduced (Miller 1973).

When listed in 1985, only two populations of Owens tui chub were believed to exist (United States Department of the Interior 1985). The Hot Creek Headwaters population is located at the headwaters of Hot Creek above the Hot Creek Fish Hatchery (Figure 23). The site consists of two springs, AB Spring and CD Spring. The Upper Owens Gorge population is located below Long Valley Dam and above the town of Bishop.

Prior to 2003, individuals from the Hot Creek Headwaters and Upper Owens Gorge populations were translocated to establish additional populations of Owens tui chubs. Currently, the Owens tui chub is limited to six isolated sites: Hot Creek Headwaters (AB Spring and CD Spring) and Hot Creek Hatchery settling ponds, Little Hot Creek Pond, Upper Owens Gorge, Mule Spring, White Mountain Research Station, and Sotcher Lake. The Hot Creek Headwaters (AB and CD Springs), Upper Owens Gorge, and White Mountain Research Station populations of the Owens tui chub are on lands owned by the Los Angeles Department of Water and Power. The White Mountain Research Station is operated by the University of California. The Mule Spring population is on land managed by the Bureau of Land Management. The populations at these six sites were thought to be genetically pure Owens tui chubs; however, recent genetic testing by the CDFW has determined that those in the Hot Creek Hatchery settling ponds and AB Spring are introgressed with Lahontan tui chub and are not genetically pure.

Three of these populations occur on National Forest System lands administered by the Inyo NF and include Little Hot Creek, Sotcher Lake and a very small portion of the settling ponds at the Hot Creek Hatchery.

The Little Hot Creek Pond is a human-created pond constructed in 1986 to enhance waterfowl habitat. It was created by impounding the stream channel downstream from the thermal headsprings of Little Hot Creek. The 2001 Sierra Nevada Forest Plan Amendment established the 3,610 acre Little Hot Creek critical aquatic refuge, which contained 3,520 acres on National Forest System Lands to provide habitat for the Owens tui chub around the occupied area in Little Hot Creek pond and the headwaters to this pond.

Sotcher Lake is outside the historical range of the species in Madera County (Figure 24). The source of Owens tui chub in this lake are not known but it is believed to have occurred in the early 1950's and may have occurred inadvertently along with trout stocking from the Hot Creek Fish Hatchery (Chen, Parmenter, and May 2007). Sotcher Lake is located in the heavily used Reds Meadow area just east of Devils Postpile National Monument. In 2010, the CDFW and USFWS evaluated the fisheries stocking program to address concerns about recreational fish stocking impacts on threatened and endangered species (ICF Jones & Stokes 2010). In that analysis, Sotcher Lake was not identified as a body of water containing Owens tui chub, thus Sotcher Lake continues to be stocked with rainbow trout and also contains brown trout. The current status of Owens tui chub in Sotcher Lake is not known although they were collected from Sotcher Lake in 2002 (Chen, Parmenter, and May 2007).

As mentioned above, there is a small portion of the settling ponds of the Hot Creek Hatchery that extend on to the Forest that are not mapped as being critical habitat. The extent that Owens tui chub use this portion of the settling ponds on National Forest System lands is not known although recent genetic testing by CDFW has determined that these fish are introgressed with Lahontan tui chub and therefore this population will not be analyzed further in this biological assessment.

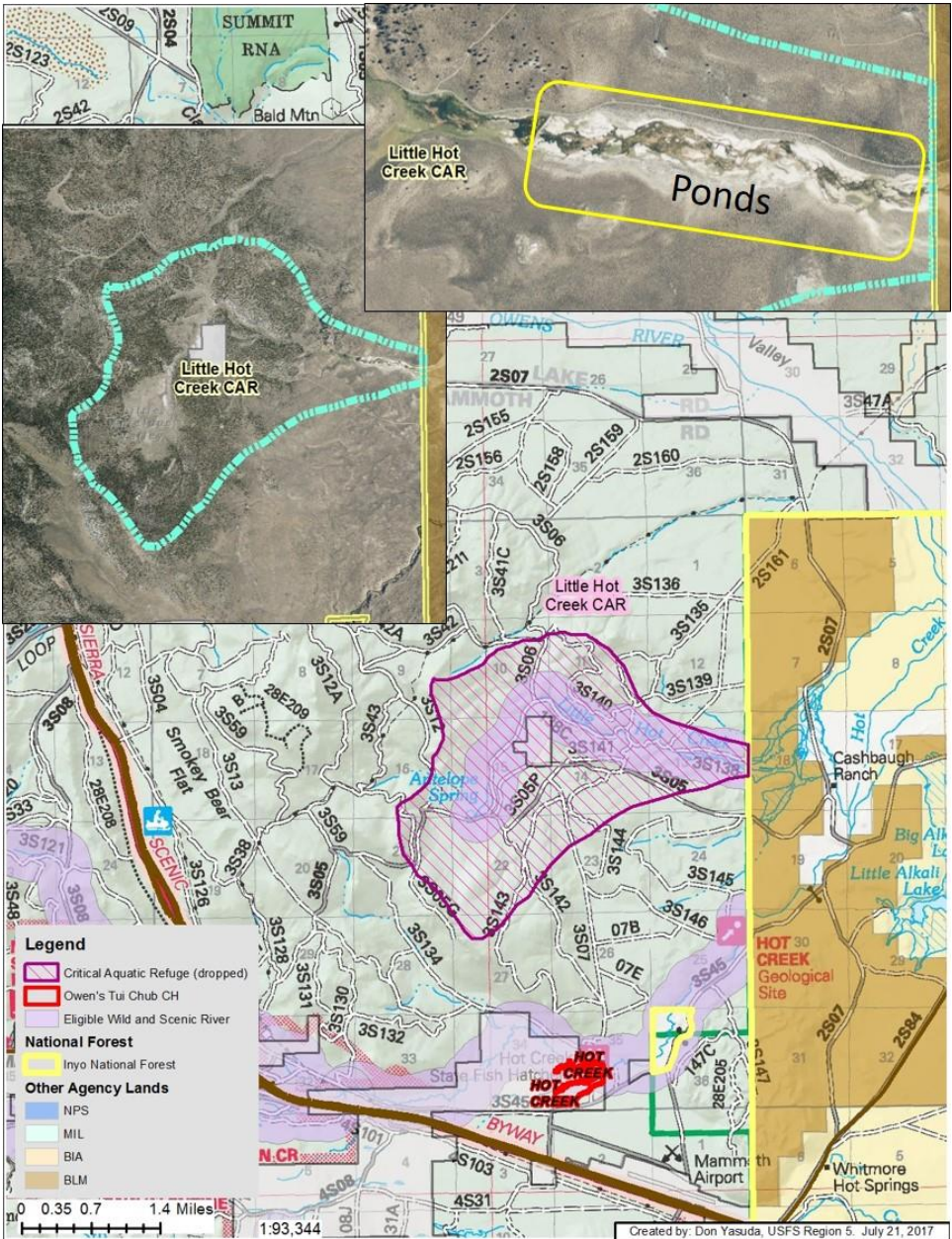


Figure 23 Little Hot Creek critical aquatic refuge with insets of the occupied Little Hot Creek Ponds

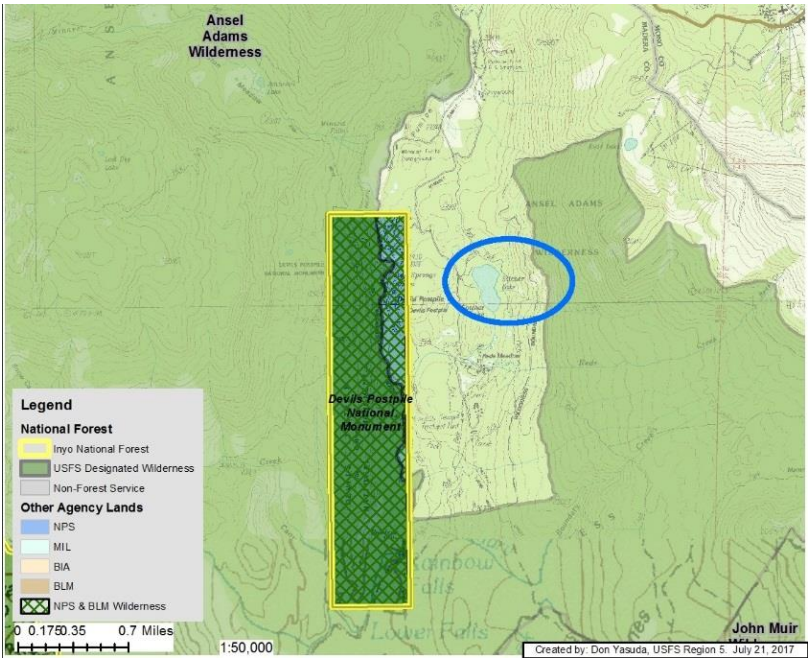


Figure 24 Location of Sotcher Lake, Owens tui chub location

Population and Habitat Status and Trend

The 5-Year Review discloses that information on Owens tui chub abundance or changes in population size is limited or unknown for the described populations. While it is known that these populations currently exist, it is not possible to determine whether they are increasing, decreasing, or stable because the methodologies used to conduct counts to estimate population size have varied. Thus, no information is available on population age structure, sex ratio, or mortality.

The Little Hot Creek Pond is shallow; covered with muskgrass (*Chara* sp.), an invasive alga which provides cover for the Owens tui chub; and has abundant cattail (*Typha* sp.). The pond is currently fenced to exclude livestock and recreation uses. The access road along the edge of the enclosure area has been surfaced with gravel to mitigate dust impacts to the pond.

No information exists on the population status and habitat trend for Sotcher Lake.

Threats

The Recovery Plan (United States Department of the Interior 1998) identified three categories of threats to be of higher concern to Owens tui chub and its habitat including:

- (1) The present or threatened destruction, modification, or curtailment of habitat or range.
- (2) Disease or predation
- (3) Other natural and manmade factors affecting the species’ continued existence.

Destruction or modification of habitat

The listing rule identified extensive habitat destruction and modification as threatening the Owens tui chub (United States Department of the Interior 1985). These continue to be threats. Currently, most streams and rivers in the Owens Basin have been diverted and some impounded. The Owens tui chub, which used to occur throughout the Owens River and its tributaries in the Owens Basin, is restricted to

six isolated populations, five of which are within the historical range of the species. Of these five populations, three (Hot Creek Headwaters, Little Hot Creek Pond, and Upper Owens Gorge) are located in small, isolated, man-altered portions of these waterways. The other two populations (Mule Spring and White Mountain Research Station) exist in man-made ponds at upland sites with water supplied by artificial methods. The occupied habitat at Hot Creek Headwaters, Little Hot Creek Pond, White Mountain Research Station, and Mule Spring is 2 acres or smaller at each site. The habitats for these five populations are threatened by water diversions, failure of infrastructures that deliver water to these habitats, and/or emergent vegetation.

Most of the water rights in the Owens Basin are owned by the city of Los Angeles. Currently, the demand for water from the Owens Basin is high and growing as Los Angeles continues to grow. The LADWP operates and maintains dams, diversion structures, groundwater pumps, and canals to capture and convey much of the water from the Owens Basin to Los Angeles. The remaining ground water, which provides water to isolated springs and springs that are the headwaters of streams in the Owens Basin, and surface water are used extensively for agriculture and municipal purposes in the Owens Basin. These man-made changes to aquatic habitat in the Owens Basin dramatically reduced suitable aquatic habitat for the Owens tui chub. They reduced the occurrence of the Owens tui chub from a common, wide-ranging species in the Owens Basin to a rare species occurring at a few sites, representing less than 1 percent of the fish's historical range (United States Department of the Interior 1985).

In addition to the increasing water demands for the greater Los Angeles area, areas adjacent to the Owens Valley (e.g., Round, Chalfant, and Hammil Valleys) are growing, and the demand for water is growing. This increased demand has resulted in an increased withdrawal of ground and surface water from the Owens Valley Groundwater Basin, which affects springs and other surface waters in the Owens Basin (Pinter and Keller 1991).

Habitat requirements for the Owens tui chub include aquatic submerged vegetation but not large amounts of emergent vegetation. At the spring sites (Hot Creek Headwaters, Little Hot Creek Pond, and Mule Spring), invasive emergent plants (e.g. cattail) have altered the aquatic habitat. Cattail proliferation results in deposition of large amounts of organic biomass, eventually converting aquatic habitat to upland habitat (Potter 2004). This conversion results in a loss of habitat for the Owens tui chub. In addition, dense emergent vegetation provides cover for nonnative predators of Owens tui chubs, such as bullfrogs and crayfish (*Procambarus* sp.), which enables non-native predators to thrive at these sites. California Department of Fish and Wildlife has installed a device in the waterway between the Hot Creek Hatchery and Hot Creek Headwaters to help remove emergent vegetation. This device requires routine, manual cleaning. No structures to remove emergent vegetation occur at the other population sites. These sites rely on routine, manual clearing of emergent vegetation. At Mule Spring, cattail has been removed by hand from littoral zone or nearshore aquatic areas. The area around Little Hot Creek pond was evaluated along with the California Department of Fish and Wildlife for management options for the emergent vegetation but the specific equipment needed wasn't available and no project has been initiated to date. The tui chub population at Little Hot Creek Pond appears to continue to reproduce and thrive in this location. At this time, control of emergent vegetation of cattails (native, although undesirable at this location) are not planned, but the forest would consider action, if feasible, if recommended by the USFWS or CDFW in order to contribute to the recovery of the Owens tui chub.

Disease or predation

Predation by introduced non-native fish, specifically brown trout, has been a major threat to the Owens tui chub. Predation by non-native largemouth bass and brown trout, both abundant in the Owens River system, has been identified as a factor eliminating Owens tui chubs from much of their historical range in the Owens River (Chen and May 2003). The presence of non-native aquatic predators in the Owens Basin has greatly limited the locations in which the Owens tui chub can survive and persist.

Much of the recreation-based economy of the Owens Basin depends on recreational fishing, primarily for trout and largemouth bass. Because of the miles of riverine habitat and the historical and current practice of angling in the Owens Basin, it is unlikely that simply curtailing future stocking of these species would eliminate them from the Basin. Consequently, restoring the Owens tui chub to most of the Owens River or its connected tributaries is unlikely to occur.

Mosquitofish are abundant at Little Hot Creek Pond. It is known that mosquitofish will prey on small individuals of Mohave tui chub, a similar species, but data are not available regarding their interaction with the Owens tui chub. Observations over time suggest that the tui chub population at Little Hot Creek Pond appears to continue to reproduce and thrive in the presence of mosquitofish in this location.

Rainbow trout and brown trout exist within Sotcher Lake and continue to be stocked in that lake by the California Department of Fish and Wildlife (ICF Jones & Stokes 2010).

Other natural or manmade factors

The final listing rule identified introduction of the Lahontan tui chub and subsequent hybridization and competition as major threats to the Owens tui chub. Although not discussed in the listing rule, stochasticity (i.e., random events), catastrophic events, and climate change are also potential threats given the limited distribution of remaining populations.

Hybridization: Until recently, the Owens tui chub and the closely related Lahontan tui chub were isolated from each other. Lahontan tui chubs were introduced as baitfish into many of the streams in the Owens Basin. This was first observed at Crowley Lake in 1973, where fishermen illegally introduced the Lahontan tui chub (Miller 1973). Since that time, hybridization between the Owens tui chub and Lahontan tui chub has been documented for populations in Mono County at Hot Creek (downstream from the hatchery), Mammoth Creek, Twin Lakes-Mammoth, June Lake, and Owens River Upper Gorge Tailbay, and in Inyo County at A1 Drain, C2 Ditch, and McNally Canal. At the time of listing, only three populations of genetically pure Owens tui chubs existed, while at the present time, it remains unclear the total remaining of genetically pure populations. The populations at six sites were thought to be genetically pure Owens tui chubs; however, recent genetic testing by the CDFW has determined that those in the Hot Creek Hatchery settling ponds and AB Spring are introgressed with Lahontan tui chub and are not genetically pure, both occur on Inyo NF.

Using Lahontan tui chubs in the Owens Basin as baitfish is not allowed under fishing regulations set by the State of California. However, Lahontan tui chubs and hybrids are already present in the Owens Basin including Crowley Lake, Hot Creek and tributaries, including Little Hot Creek, and the lower portion of the Owens Gorge. If man-made barriers isolating the Owens tui chub populations at these sites are degraded or removed, this degradation/removal could result in the loss of the pure populations of Owens tui chubs at Hot Creek Headwaters, Little Hot Creek Pond, and the Upper Owens Gorge. In addition, the opportunities to establish new populations of Owens tui chubs in the Owens Basin is limited by the presence of hybrids in the Owens River and tributaries, the historical habitat for the Owens tui chub. Currently, the only viable locations for establishing the Owens tui chub are isolated springs or the headwaters of streams with downstream barriers to upstream movement of Lahontan tui chubs or hybrids. Since the Little Hot Creek Pond is close to the national forest boundary, the barriers on Little Hot Creek are primarily water diversion for irrigation off the National Forest System lands that keep the natural creek from connecting with the Owens River.

Competition: The final listing rule identified competition with non-native fish species as a threat to the Owens tui chub. However, little specific information on the impact of competition on the Owens tui chub is available in the literature. Non-native insectivorous fish occur at Hot Creek Headwaters (rainbow trout) and Little Hot Creek Pond (mosquitofish). A major part of the diets for these non-native species

is the same aquatic insects consumed by Owens tui chubs. Although information is not available for rainbow trout completion and predation on this species, mosquitofish are known to affect some southwestern native fishes through competition and predation.

Stochasticity: The creation and maintenance of small, often intensively managed populations have prevented extinction of the Owens tui chub. Only six populations of the Owens tui chub exist, and they are isolated from each other. Species consisting of small populations, such as the Owens tui chub, are recognized as being vulnerable to extinction from stochastic (i.e., random) threats, such as demographic, genetic, and environmental stochasticity and catastrophic events.

Demographic stochasticity includes random variability in survival and/or reproduction among individuals within a population. Random variability in survival or reproduction can have a significant impact on population viability for populations that are small, have low fecundity (reproduction rates), and are short-lived. Currently Owens tui chub populations are small, between 100 and 10,000 individuals; therefore, random events that may cause high mortality, or decreased reproduction may have a significant effect on the viability of Owens tui chub populations. Furthermore, because the number of populations is small (six) and each is vulnerable to this threat, the risk of extinction is exacerbated.

Genetic stochasticity results from the changes in gene frequencies caused by founder effect, random fixation, or inbreeding bottlenecks. Founder effect is the loss of genetic variation when a new population is established by a very small number of individuals. Random fixation is when some portion of loci is fixed at a selectively unfavorable allele because the intensity of selection is insufficient to overcome random genetic drift. Random genetic drift happens when only a portion of alleles in the population is transmitted from one generation to the next, because only a fraction of all possible zygotes become breeding adults. A bottleneck is an evolutionary event in which a significant percentage of a population is killed or prevented from breeding.

In small populations, such as the Owens tui chub, these factors may reduce the amount of genetic diversity retained within populations and may increase the chance that deleterious recessive genes are expressed. Loss of diversity could limit the species’ ability to adapt to environmental changes and contributes to inbreeding depression (i.e., loss of reproductive fitness and vigor). Deleterious recessive genes could reduce the viability and reproductive success of individuals. Isolation of the six remaining populations preventing any natural genetic exchange will lead to a decrease in genetic diversity.

Environmental stochasticity is the variation in birth and death rates from one season to the next in response to weather, disease, competition, predation, or other factors external to the population. Drought or predation in combination with a low population year could result in extinction. The origin of the environmental stochastic event can be natural or human-caused. The Owens tui chub has experienced population loss from environmental stochastic events and will likely do so in the future. Owens tui chubs have disappeared from the Owens Valley Native Fishes Sanctuary (Fish Slough on Bureau of Land Management lands). Reasons for the loss of this population are not known, but the small, isolated nature of this population likely contributed to their extirpation.

Catastrophic events are an extreme form of environmental stochasticity. Although they generally occur infrequently, catastrophic events, such as severe floods or prolonged drought, can have disastrous effects on small populations and can directly result in extinction. All three of these factors may also act in combination. One possible scenario of how these factors in combination could increase the risk of extinction for the Owens tui chub would be the loss of one or two populations during a drought period at the same time a predator is introduced to one of the remaining populations. Although one or two of the populations may survive and be a source for future reintroductions, the resulting loss of genetic diversity would further increase the risk of extinction.

Climate change: Impacts to the Owens tui chub under predicted future climate change are unclear. However, a trend of warming in the Sierra Nevada and Inyo Mountains is expected to increase winter rainfall, decrease snowpack, hasten spring runoff, reduce summer stream flows, and reduce ground water recharge. Increased summer heat may increase the frequency and intensity of wildfires. Loss of upland and riparian vegetation leads to soil erosion, increased sedimentation, down cutting of waterways, loss of bank stabilization, and decreased ability of soils to hold moisture and slowly release it into nearby waterways, all of which would negatively affect Owens tui chub habitat. While northward and/or higher elevation habitats could be important factors in the future conservation of this species, currently the isolated populations of the Owens tui chub are unable to access these habitats because of other threats, including a lack of connectivity of habitats caused by physical barriers (e.g., dams and diversion structures); habitat destruction and alteration; and predation, competition, and hybridization with introduced species.

Analysis of Effects

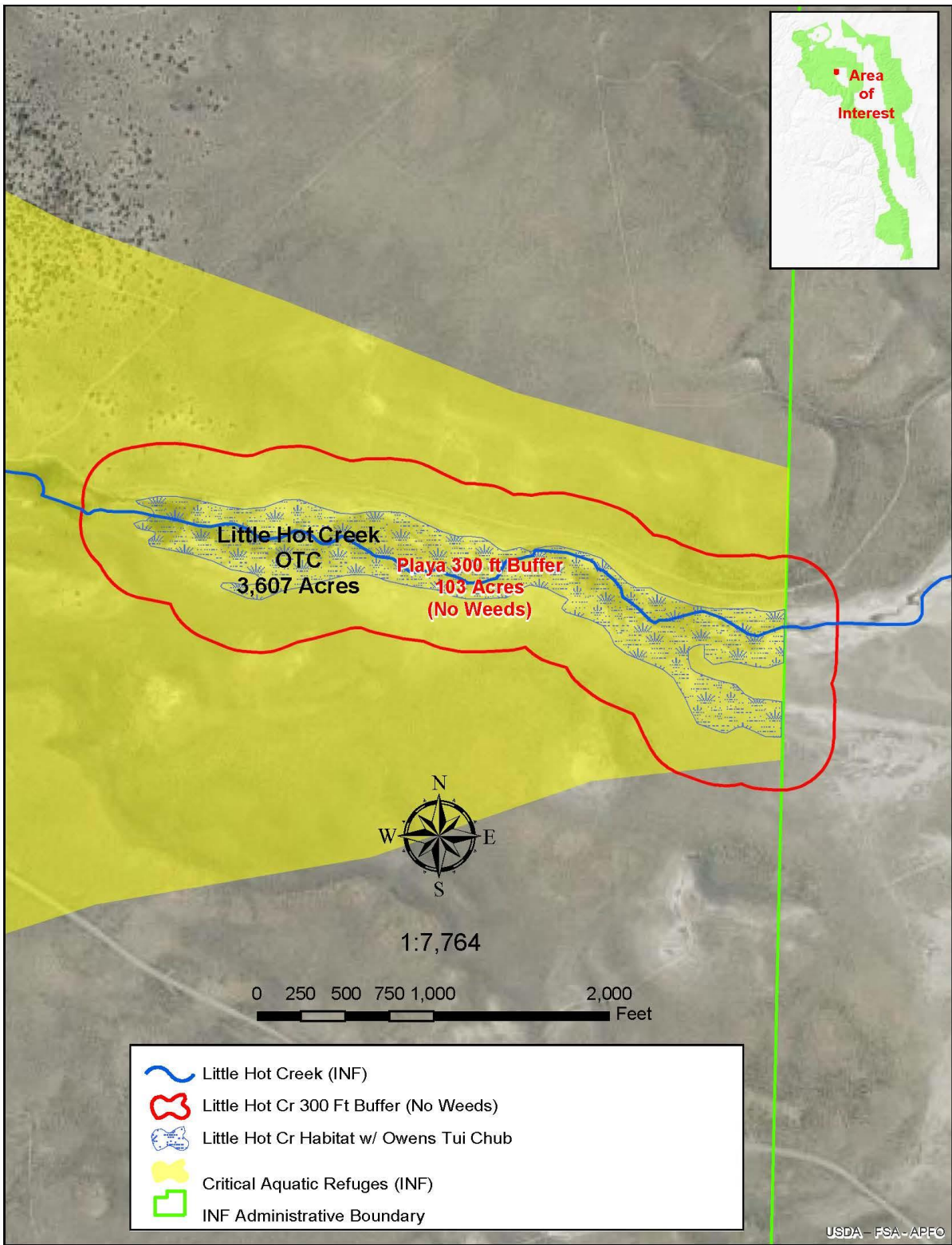
Current Noxious Weeds Locations within Owen’s Tui Chub Habitat

Within the project area, there are currently zero mapped weed infestations, totaling approximately zero acres, within 300 feet of an occupied stream for out-of-basin OTC (Table 16 and Figure 25).

Table 16 Acres of noxious weeds within 300 feet of occupied Owen’s tui chub on Inyo NF (no designated critical habitat on Inyo NF)

INYO NF SITES	FS DISTRICT/ COUNTY	OTC OCCUPANCY STATUS	OCCUPIED CREEK/LAKE MILES	WEED ACRES (within 300')	WEED SPECIES	TREATMENT METHOD
Hot Creek Hatchery settling ponds ¹ (small portion)	Mammoth RD /Mono	Introgressed	<0.1	0	N/A	N/A

Figure 25 Owens Tui Chub, Little Hot Creed Population & Weed Locations



Direct and Indirect Effects

The forest plan does not include species-specific plan direction for Owens tui chub so relevant direction is primarily found in direction for riparian conservation areas and critical aquatic refuges that provide for a variable distance buffer area surrounding streams and protections of bodies of water. The Proposed Action includes the Annual Implementation Process which will provide for Owens tui chub habitat conservation to sustain their viability to the extent that invasive plant treatment activities occur within the occupied portions of the Hot Creek watershed and are as follows:

Federally Threatened or Endangered Fish (Lahontan and Paiute cutthroat trout (LCT and PCT) and Owen’s tui chub)

- 23. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within 300 feet of occupied LCT, PCT, and Owen’s tui chub streams, to ensure treatments follow design features outlined below.
- 24. Chemical treatments within 50 feet of LCT, PCT, and Owen’s tui chub occupied habitat would be limited to direct foliar, spot spray, or hand application of glyphosate, imazapyr, or triclopyr-TEA.

Manual, Mechanical, Cultural, and Herbicide Treatments:

Weed treatment occurring within known locations where water is expected would be limited to direction of application label as well as design feature buffers depending and time of year. Human disturbance from weed treatments (including hand pulling) may encounter individuals and cause them to be disperse. However, this disturbance would be temporary, lasting only the day (or two) and would not result in any measurable impacts to the viability of individuals or the population. Herbicides used to control annual grasses, including clopyralid are used as a pre-emergents that are applied during the fall months. Non-native thistles and knapweeds would either be hand pulled or treated with an herbicide such as aminopyralid or chlorsulfuron. The ecological effects of the above herbicides as well as glyphosate, imazapyr, and triclopyr are further discussed in Herbicide Toxicity. There will be no direct or indirect impacts to the Owen’s tui chub from the use of herbicides. SERA risk assessments were reviewed and indicate that at proposed application rates, the estimated doses from the exposure scenarios are all less than the reported NOAEL (no-observable adverse effect level) for all herbicides. There are no acute or chronic exposure scenarios at application rates described in the Proposed Action that will result in a Hazard Quotient (HQ) above one for fish. Herbicides and surfactants applied as described in the Proposed Action pose no risk to these species. Under the Proposed Action, triclopyr will only be used in limited situations, primarily to treat woody species such as salt cedar tamarisk. Triclopyr is applied using hand application methods such as wick and wipe on individual plants or cut-stump application which will minimize the risk of non-target exposure and accidental drift.

There are no areas currently identified for tarping or mulching within this species habitat however the future may warrant this method. The greatest likelihood that tarping or mulching would be used on the Inyo NF would be when fire planning teams identify potential impacts from fire suppression activities that have a high likelihood for weed infestations on listed species habitat. For aquatic species these would be within riparian buffers where disturbance in and within proximity of noxious seed banks such as cheatgrass or Canada thistle. Misapplication in retardant

avoidance zones could warrant any method in Proposed Action to be included in Repair Plans post fire. Future restoration projects with objective to remove weeds or suppress seed banks and restore the native flora diversity are likely to occur.

Biological Controls

It is unlikely biological control methods would be used within these protected fenced habitats. However a major disturbance such as wildfire may result in some localized expansions of noxious weeds where the use of biological control insects may be determined to be appropriate. If biological controls are determined to be an appropriate treatment method, there will be no measurable effects to Owen’s tui chub or their habitat. Under the Proposed Action, only biological control agents that are permitted for release by the USDA Animal Plant Health Inspection Service (APHIS) and the California Department of Food and Agriculture (CDFA) will be used. Before being permitted by APHIS and CDFA, these insects must undergo considerable testing and meet other strict criteria prior to their release to ensure they will not pose a threat to non-target species (CDFA 2018). By utilizing only federally and state approved insects to control noxious weeds, the risk for inadvertent harm to native vegetation in the project area is minimal.

As described in the Effects Common to Habitats and Species, eliminating weeds indirectly contributes to riparian conservation areas objectives to provide beneficial functions such as providing cold, clean water; stream shading; aquatic/riparian habitat for indicator; and nutrients. There are also many specific standards and guidelines that would avoid, mitigate, or minimize certain types of activities or intensities or magnitudes of effects within riparian conservation areas and to riparian resources. These plan components collectively help assure stream and riparian habitats are conserved and restored for long-term sustainability and resilience, and species long-term viability.

There will be no negative impacts to habitat for Owen’s tui chub under the proposed action. The treatment of these noxious and invasive weeds will be a negligible loss to existing habitat and will not impact this species. Over the long term, control and eradication of noxious weeds will help maintain quality habitat for Owen’s tui chub.

Determination

Key conclusions:

- Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.
- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- The following Project Design Features will apply:
 - 23. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within 300 feet of occupied LCT, PCT, and Owen’s tui chub streams, to ensure treatments follow design features outlined below.
 - 24. Chemical treatments within 50 feet of LCT, PCT, and Owen’s tui chub occupied habitat, would be limited to application (direct foliar, spot spray, had application) of glyphosate, imazapyr, triclopyr-TEA.

Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by future restoration activities, adoption of the Proposed Action *may affect, and is not likely to adversely affect* the Owen’s tui chub.

Sierra Nevada Bighorn Sheep and Critical Habitat

The Sierra Nevada Bighorn Sheep Recovery Plan (United States Department of the Interior 2004, 2007), the 5-Year Review (United States Department of the Interior 2008c) and the 2014 and 2010 annual reports from the California Department of Fish and Wildlife (Runcie et al. 2015, Stephenson et al. 2012) describes key habitat, life history requirements, distribution and threats compiled from a variety of best available science sources. The relevant information is summarized here, generally without the specific source attributions, except where other sources are used or where it may aid in identifying which document contains additional detail.

Classification, Critical Habitat and Recovery Plan

The Sierra Nevada DPS of California bighorn sheep was listed as an endangered species on January 3, 2000, following emergency listing on April 20, 1999 (United States Department of the Interior 1999, 2000). At the time of the emergency listing, the population was thought to total no more than 125 animals distributed across five separate areas of the southern and central Sierra Nevada (United States Department of the Interior 2000). The Sierra Nevada DPS of the California bighorn sheep (*Ovis canadensis californiana*) was classified as its own Sierra Nevada bighorn sheep subspecies (*Ovis canadensis sierrae*) in 2005 (Wehausen, Bleich, and Ramey II 2005). In 2008 the taxonomic name change to the Sierra Nevada Bighorn sheep (*Ovis canadensis sierra*) was officially recognized (United States Department of the Interior 2008a).

In 2008, the USFWS designated approximately 417,577 acres of critical habitat for this species in Tuolumne, Mono, Fresno, Inyo and Tulare Counties (United States Department of the Interior 2008a). Critical habitat includes 12 herd units within the recovery area on portions of the Humboldt-Toiyabe, Inyo, and Sierra National Forests and in Yosemite, Sequoia, and Kings Canyon National Parks. Ten of these herd units occur on the Inyo NF (Table 17). Of these ten herd units, 75 percent, approximately 278,805 acres, occur on the Inyo NF. The majority of the remaining portions of the herd units occurs in designated wilderness managed by the National Park Service. On the Inyo NF, 94 percent, approximately 262,948 acres, occurs with designated wilderness and much of the remaining acres occur in adjacent inventoried roadless areas.

Table 17 Acres of Sierra Nevada bighorn sheep critical habitat herd units in wilderness and total acres on the Inyo National Forest

Herd Unit Number	Herd Unit Name	Recovery Unit	Total Herd Unit Acres	Total Herd Unit Acres, Inyo NF	Total Herd Unit Acres, Inyo NF Wilderness
1	Mt. Warren	Northern	36,005	27,474	23,483
2	Mt. Gibbs	Northern	29,698	21,134	20,425
3	Convict Creek	Central	36,519	35,042	32,240
4	Wheeler Ridge	Central	80,985	55,981	51,449
5	Taboose Creek	Southern	28,816	21,644	21,036
6	Sawmill Canyon	Southern	30,521	13,470	13,028
7	Mt. Baxter	Southern	32,234	18,851	18,621
8	Mt. Williamson	Southern	32,576	28,427	27,981
10	Mt. Langley	Southern	32,862	26,693	24,982
12	Olancha Peak	Southern	30,438	30,089	29,703

The USFWS, in identifying critical habitat, also identified primary constituent elements (PCEs), which are physical or biological features considered essential to the conservation of the species and that may require special management considerations or protection (United States Department of the Interior 2008a). Relevant to management on the Inyo NF, these include:

- Non-forested habitats or forest opening within the Sierra Nevada from 4,000 feet to 14,500 feet in elevation with steep (greater than or equal to 60 percent slope), rocky slopes that provide for foraging, mating, lambing, predator avoidance, and bedding as well as seasonal elevation movements between these areas.
- Presence of a variety of forage plants as indicated by the presence of grasses (e.g., *Achnantherum* spp.; *Elymus* spp.) and browse (e.g., *Purshia* spp. (rose)) in winter, and grasses, browse, sedges (e.g.. *Carex* spp.) and forbs (e.g., *Eriogonum* spp. (buckwheat)) in summer.
- Presence of granite outcroppings containing minerals such as sodium, calcium, iron, and phosphorus that could be used as mineral licks in order to meet nutritional needs.

The Final Recovery Plan for Sierra Nevada Bighorn Sheep was completed in 2007 (United States Department of the Interior 2007). The recovery area for Sierra bighorn includes four Recovery Units: Northern, Central, Southern, and Kern. Within these Recovery Units there are sixteen herd units, and the Inyo NF contains portions of 10 herds.

The Recovery Plan identifies several Recovery Actions that are relevant to this weed management project on the Inyo NF:

Task 1. Protect bighorn sheep habitat.

Task 1.2. Maintain and/or enhance integrity of bighorn sheep habitat. Habitat integrity could be compromised by fire suppression that affects vegetation succession (see Task 2.2.3), or a variety of human uses (see Task 2.4).

Task 2. Increase population growth by enhancing survivorship and reproductive output of bighorn sheep.

Task 2.2. Increase use of low elevation winter ranges.

Task 2.2.3 Enhance bighorn sheep winter range habitat to increase visibility where appropriate.

Task 2.3. Minimize probability of bighorn sheep contracting diseases causing mortality and morbidity.

Task 2.3.1. Prevent contact between bighorn sheep and domestic sheep or goats.

Habitat and Life History

Optimal habitat is visually open and contains steep, generally rocky slopes that provide for detection of predators. Sierra Nevada bighorn sheep generally avoid dense forests and thick brush, which tend to increase susceptibility to predation, but will use open woodland habitats on rocky slopes (United States Department of the Interior 2008d). They use a wide range of elevations, from alpine peaks in excess of 13,000 feet to the base of the eastern escarpment as low as 4,000 feet (United States Department of the Interior 2008a). The species uses a wide variety of vegetation communities, including: (1) Great Basin sagebrush-bitterbrush-bunchgrass scrub; (2) pinyon-juniper woodland and mountain mahogany scrub; (3) mid-elevation and subalpine forests, woodlands, and meadows; and (4) alpine meadows and other alpine habitats varying from cliffs to plateaus (United States Department of the Interior 2008a). In winter, they occupy high, windswept ridges, if weather conditions allow, or migrate to the lower elevation sagebrush-steppe habitat (United States Department of the Interior 2008a). Both sexes utilize the same breeding and winter ranges, but in summer females use alpine environments along the Sierra Nevada crest and males are often found at lower elevations in subalpine habitats (United States Department of the Interior 2008a).

Bighorn sheep tend to live in groups, which allow for more visual awareness of predators. Bighorn sheep are primarily diurnal and daily activity can show some predictable patterns that consist of feeding and resting periods. Nights are spent on rocky slopes, but feeding activities may occur short distances away from rocky escape terrain. This distance to escape terrain can be influenced by visual openness of vegetation or weather, wind, gender, season and abundance of predators (United States Department of the Interior 2007). Birthing season begins at the end of April and extends through early July, with most of the births occurring in May and June (United States Department of the Interior 2007).

Historic and Current Distribution

Historically, Sierra Nevada bighorn sheep were once scattered along, and east of, the alpine crest of the Sierra Nevada from the Sonora Pass area south to Olancha Peak. They also occurred in similar habitat west of the Kern River as far south as Maggie Mountain, with concentrated use in the regions of Mineral King, Big Arroyo, and Red Spur. Of the 16 areas in the Sierra Nevada that likely had separate bighorn sheep herds, only nine are known to have persisted to the beginning of the twentieth century (United States Department of the Interior 2007). Sierra Nevada bighorn sheep persisted in only two areas in the Sierra Nevada by the 1970s, constituting three herds (Wehausen 1980). These included the Mount Baxter, Sawmill Canyon, and Mt. Williamson herds. Because of the large population size and productivity, the Mt. Baxter and Sawmill Canyon herds were used as sources of reintroduction stock beginning in 1979, with subsequent translocations in 1980, 1982, 1986, 1987, and 1988. Those sheep were used to reestablish populations at Wheeler Ridge, Mt. Langley, and Lee Vining Canyon. Since listing, Sierra Nevada bighorn sheep have been introduced and populations augmented into the Mt. Warren and Mt. Baxter herd units.

Currently, Sierra Nevada bighorn sheep occur in the Mt. Warren and Mt. Gibbs herd units of the Northern Recovery Unit; Convict Creek and Wheeler Ridge herd units of the Central Recovery Unit in Inyo and Sierra National Forests; and Taboose Creek, Sawmill Canyon, Mt. Baxter, Mt. Williamson, Bubbs Creek, Mt. Langley and Olancha Peak herd units in the Southern Recovery Unit in Mono and Inyo Counties (Runcie et al. 2015). In the summer, animals from the Convict Creek and Wheeler Ridge area use summer range on both the Sierra NF and Inyo NF. Both of these populations use high elevations along the Sierra Nevada crest during the spring through fall and migrate east into the Inyo NF to lower elevation winter ranges.

Natural colonization and range expansion has occurred in the Bubbs Creek area, a non-essential herd unit, and the Convict Creek herd unit. Sierra Nevada bighorn sheep from the Mt. Williamson and Mt. Baxter herd units occupied the Bubbs Creek area in 2002. In 2011 three adult ewes, three lambs, and a yearling ram were observed on Esha Peak in the Convict Creek herd unit (Stephenson et al. 2012). Evidence of range expansion in the Sawmill Canyon herd has also been documented. In 2009, one collared ewe moved north over Taboose Pass into the Taboose Creek herd unit. Since that time the CDFW has observed several animals in this herd unit and believe that natural colonization is occurring between this herd unit and the Taboose Creek herd unit (Runcie et al. 2015). Two bighorn sheep were observed in the Coyote Ridge herd unit, a non-essential herd unit, in 2009, but further use of this area by bighorn sheep has not been observed (Stephenson et al. 2012).

Translocations have been implemented over the last several years and have led to the expansion of Sierra bighorn sheep within the recovery area (Runcie et al. 2015). In 2013, fourteen bighorn (10 ewes and 4 rams) were introduced into the Olancha Peak herd unit. This population was augmented with several rams in 2014. Also in 2014, ewes and rams were introduced into the Big Arroyo herd unit in Sequoia and Kings Canyon National Parks. Introductions occurred in the spring of 2015 into the Laurel Creek herd unit and the Cathedral Range herd unit, a new area within the Northern Recovery Unit in Yosemite National Park. With these introductions and the natural colonization of the Taboose Creek herd unit, 14 herd units are occupied by Sierra Nevada bighorn sheep, meeting the distribution requirements identified in the Recovery Plan (Runcie et al. 2015).

Population and Habitat Status and Trends

The total population of bighorn sheep in the Sierra Nevada prior to settlement is unknown, but it probably exceeded 1,000 individuals (United States Department of the Interior 2007). At the time of emergency endangered listing in the spring of 1999, a minimum of 117 sheep could be accounted for. Bighorn numbers have increased dramatically in the Sierra Nevada since the time of the listing. At the time the Recovery Plan was written the population was projected at 325 to 350 individuals (United States Department of the Interior 2008a). The 2010-2011 Annual Report of the Sierra Nevada Bighorn Sheep Recovery Program: A Decade in Review reported that the population as of 2012 was above 400 bighorn sheep and had expanded into ten of the twelve essential herd units needed for recovery (Stephenson et al. 2012). Reproduction and recruitment in the two largest herds, Wheeler Ridge and Mt. Langley, have declined with increasing population size, suggesting that density-dependent mechanisms may affect small endangered populations (Stephenson et al. 2012). The static population decline at Wheeler Ridge in the early 2000s may also reflect emigration events leading to natural colonization of adjacent habitat (Stephenson et al. 2012). Recent population estimate shows the population climbing over 600 animals and range expansion into all twelve essential herd units (Runcie et al. 2015).

The vast majority of the herd units are comprised of the alpine and subalpine vegetation type with smaller amounts of other vegetation types (Table 18).

Table 18 Acres of vegetation types within Sierra Nevada bighorn sheep critical habitat herd units

Herd Unit Name	Alpine and Subalpine	Mountain Mahogany	Conifer	Pinyon-juniper, Sagebrush, Xeric Shrubs	Lake and Other
Mt. Warren	21,961	1,917	1,310	2,007	279
Mt. Gibbs	17,386	953	1,503	943	350
Convict Creek	23,776	1,459	1,337	7,031	1,440
Wheeler Ridge	41,789	5,541	673	6,581	1,397
Taboose Creek	11,108	4,949	282	4,920	384
Sawmill Canyon	6,522	1,710	2,756	2,423	59
Mt. Baxter	10,982	2,695	2,459	2,538	177
Mt. Williamson	16,910	3,166	1,465	6,704	181
Mt. Langley	13,010	1,914	1,325	10,401	42
Olancha Peak	5,943	689	6,060	17,247	149

Due to the rocky and harsh conditions, the alpine and subalpine vegetation types are still largely similar to the expected natural range of variation with some increases in small tree densities as a result of fire suppression (Meyer 2013b). However, an evaluation of climate envelopes suggests that there is a high climate vulnerability of subalpine forests by the end of the century which could result in increased vegetation impacts from future wildfires and from increased tree mortality from insects (mountain pine beetle) and disease (white pine blister rust) (Meyer 2013b). There is the potential that these stressors on vegetation could benefit bighorn sheep by reducing vegetation density and improving visibility of predators but changes to forage plants could also occur.

Threats

The Recovery Plan and 5-Year Review evaluated the five reasons for listing and determined that two were not substantial or a reason for listing: the present or threatened destruction, modification, or curtailment of its habitat or range, and overutilization for commercial, recreational, scientific, or educational purposes. The remaining three are discussed below:

Disease and Predation

The CDFW reported that predation and stochastic weather events such as avalanches account for much of the spatial and temporal variation in survival rates (Stephenson et al. 2012). They identified mountain lion predation as a significant cause of ewe mortality in the Southern Recovery Unit, but avalanche is the most significant natural cause of ewe mortality in the Central and Northern Recovery Unit. Predator management is within the authority of the CDFW and the Inyo NF coordinates and cooperates with the CDFW and USDA Wildlife Services to support efforts to manage the predation risks to Sierra Nevada bighorn sheep. These agencies, not the Forest Service, would be the primary agents to evaluate and take action on managing predators to Sierra Nevada bighorn sheep.

The main mortality factors for Sierra bighorn include diseases and parasitism and predation. Numerous diseases of bighorn sheep have been documented (Bunch et al. 1999), of which pneumonia and psoriatic scabies have had the greatest population-level effects. Bighorn sheep show a high susceptibility to pneumonia, usually caused by bacteria *Mycoplasma ovipneumoniae*. Just recently researchers have learned that the bacteria *M. ovipneumoniae* influences the immune system, allowing secondary infections, like *Mannheimia haemolytica* to destroy lung tissues and often, lead to mortality (Besser et al. 2008, Besser et al. 2014). The greatest risk of disease transmission is between bighorn sheep and domestic sheep and goats, which are carriers of Pasteurella-family bacteria. The potential for the transfer of disease from domestic sheep to bighorn sheep was a key factor in the endangered species listing (United States Department of the Interior 2000).

The Inyo NF has coordinated with the USFWS and the CDFW to vacate, close, or not authorize domestic sheep or goat grazing within the high risk area identified by Clifford et al (2009) using a risk assessment model. These existing forest actions have minimized the risk of disease transmission in the high risk area from authorized livestock grazing. Despite this reduction in risk on the National Forest System lands, the risk of disease transmission has remained high in some areas due to domestic sheep grazing on private lands adjacent to low elevation winter ranges in the Northern Recovery Unit and Central Recovery Unit (Runcie et al. 2015). However, in 2017, with input from the USFWS and the CDFW, the Mono County Board of Supervisors voted to not re-issue a sheep grazing lease on the Conway and Mattly Ranches when it expired in November 2017.

Although there is no goat grazing within authorized allotments. There is currently in place forest orders issued to restrict goat use within identified areas within the Sierra Nevada bighorn sheep range.

In the Sierra Nevada, mountain lions have been identified as the primary predator of bighorn sheep, accounting for 96 percent of losses attributed to predation (United States Department of the Interior 2007). Mountain lion predation of bighorn sheep on winter ranges has accounted for the majority of documented mortalities since the 1970s. This predation increased from the 1970s to the 1980s and is postulated as the cause of a coincident and marked decrease in winter range use by Sierra Nevada bighorn sheep (Wehausen 1996). Subsequent population declines have been attributed to this change in winter habitat selection. Mountain lion predation was one of the listing factors (United States Department of the Interior 2000). The CDFW has the primary responsibility for managing mountain lions and has implemented an adaptive management strategy with regard to mountain lion predation. Since listing in 1999, the CDFW, working with USDA Wildlife Services, has selectively removed mountain lions that preyed on bighorn sheep in the Central and Southern Recovery Units (Stephenson et al. 2012). The CDFW believes this has lessened the pressure on bighorn sheep populations in these recovery units (Stephenson et al. 2012).

Analysis of Effects

Current Noxious Weeds Locations within Sierra Nevada Bighorn Sheep Habitat

A total of 14 species of weeds are known to occur within SNBS CH. This accounts for 107 sites that equal 1,995.8 acres which is 0.00047% of all CH and 0.71% of CH on Inyo NF. Below describes the strategy category and briefly discusses weed in relation to SNBS suitable habitat:

1. Eradicate: Annually treat and monitor the infestation with the goal of complete elimination of the species (total 0.6 acres; e.g. hairy whitetop at parking lot and spotted knapweed roadside).
2. Control: Treat and monitor a portion of the infestations each year, focusing on reducing the acreage and percent cover over time (zero acres known).
3. Contain: Treat leading edge or new satellite infestations, or where concurrent with high-value resources (1,935.7 acres; e.g. cheatgrass makes up 93% of these acres, Russian thistle roadside, 3 ac red brome, others unlikely to treat).
4. Limited/No treatment: Limited to site-specific restoration projects or no treatment efforts at this time (59.9 acres; e.g. 7 weed species total all unlikely to treat & herb Sophia and dandelion make up 92% of these acres).

Within the SNBS range on the Inyo NF their elevational break of 8000 feet is used to distinguish between summer and winter range and is used for this analysis. Dividing the range provides a temporal and spatial analysis to reflect potential for disturbance from implementation, acknowledge the different seasonal needs for each sex for feeding, night beds, birthing sites, lamb rearing, and migration routes between suitable habitat patches and timing of plant life stages and treatment methods of current and future infestations.

Summer range, between 8,000 to 14,000 feet, are environments typically not susceptible to noxious and invasive weed infestations. These environments tend to have low vegetation densities due to the granitic, rocky soil types, short growing season and other ecological factors, as well as a lack of disturbance and vectors. No high-priority invasive plants are currently known to occur in these environments. Cheatgrass makes up 93% of the acres known to occur in summer range is highly unlikely to persist in granitic, rocky soil types where sheep graze. The proposed action is expected to be successful in controlling these species only in limited situations where they occur as isolated infestations or concurrent with another high-priority resources to warrant their treatment. Changing climates and the potential for a large disturbance such as wildfire, could provide the conditions suitable for introduction of or expansion of new weed infestations could trigger treatments that control leading edge and or satellite occurrences could be accomplished.

Summer SNBS range above 8,000 feet the occurrences of 5 noxious invasive weed species occur in at 18 locations and make up less than 733 acres (708.6 ac cheatgrass).

The occurrences of 11 noxious invasive weed species occur in SNBS winter range at 89 locations that make-up less than 1,262 acres (1,179 ac are cheatgrass). Only 4 of these 11 weed species are likely to receive treatments requiring multiple treatment methods, multiple times in a year and require follow-up treatment for a few years. The obligation to follow through is required to prevent re-infestations from taking root.

It is important to consider that implementation in winter range during summer months would not occur in occupied habitat for SNBS because SNBS are at high elevation summer ranges. Implementing treatments during the winter months could result in disturbance of individuals within the winter range although much of the mapping exercise of current locations are unsuitable environments for SNBS and the risk of disturbance by field crews is low because the view is unobstructed in winter range and SNBS are capable of retreating.

Table 19 below includes the Botanist opinion to implement weeds within SNBS CH and denotes the weeds ability to be eradicated and relationship to SNBS suitable habitat. In conclusion weeds listed in Table 19 are considered low quality forage, are not expected to occur in foraging habitat for SNBS but are considered a threat to native flora (i.e., desirable forage).

Table 19 Weeds & Strategy within Sierra Nevada Bighorn Sheep Critical Habitat by Winter and Summer Range

Weed Species & Elevation	Winter Range <8,000'	Total Sites	Total Acres	Treatment Strategy	Method
cheatgrass Below 8,000 ft	Winter Range	53	1178.97	3	hand-pull small infestations; possibly spray with fluazifop (grass-specific herbicide); these would only be successful for isolated infestations, otherwise the adjacent seed source would quickly re-infest the treated area
common mullein Below 8,000 ft	Winter Range	7	4.30	4	unlikely to treat; not rated by CDFA, limited impact by Cal-IPC, therefore minimal environmental impact; treatment options include hand-digging or direct foliar spray
curvseed butterwort Below 8,000 ft	Winter Range	2	0.22	4	unlikely to treat; not rated by CDFA or Cal-IPC, therefore minimal environmental impact; treatment options include direct foliar spray
fivehorn smotherweed Below 8,000 ft	Winter Range	3	6.18	3	hand pull, mow, or direct foliar, but only for isolated high-priority infestations; this species is common at lower elevations of the forest on the south zone; this is what we are trying to remove from the nesting habitat for gulls on Mono Lake islets- will require follow-up herbicide or pulling treatment
hairy whitetop Below 8,000 ft	Winter Range	2	0.04	1	high priority- this site is at the packstation at Pine Creek in a debris pile by the parking lot; direct foliar spray with herbicide
herb sophia Below 8,000 ft	Winter Range	4	30.11	4	unlikely to treat; not rated by CDFA, limited impact by Cal-IPC, therefore minimal environmental impact; this species is common in disturbed areas at low-mid elevations on the forest; treatment options include hand-pulling or direct foliar spray
oval-leaf knotweed Below 8,000 ft	Winter Range	1	0.27	4	unlikely to treat; not rated by CDFA or Cal-IPC, therefore minimal environmental impact; treatment options include hand-digging or direct foliar spray
prickly Russian thistle Below 8,000 ft	Winter Range	9	38.59	3	hand-pull prior to seed set; these would only be successful for isolated infestations, otherwise the adjacent seed source would quickly re-infest the treated area; typically occurs in disturbed areas e.g. roadsides, can spread into burns
red brome Below 8,000 ft	Winter Range	2	3.11	3	hand-pull small infestations; possibly spray with fluazifop (grass-specific herbicide); these would only be successful for isolated infestations, otherwise the adjacent seed source would quickly re-infest the treated area
sweetclover Below 8,000 ft	Winter Range	5	0.32	3	unlikely to treat; not rated by CDFA or Cal-IPC, therefore minimal environmental impact; treatment options include hand-digging or direct foliar spray, for isolated or high-priority (for other reasons) sites only
tall tumbled mustard Below 8,000 ft	Winter Range	1	0.05	4	unlikely to treat; not rated by CDFA or Cal-IPC, therefore minimal environmental impact; treatment options include hand-digging or direct foliar spray
Winter Range Totals =		89	1262.15		
Weed Species & Elevation	Summer Range >8,000'	Total Sites	Total Acres	Treatment Strategy	Method
spotted knapweed Above 8,000 ft	Summer Range	2	0.20	1	high-priority- this site is along a road at the edge of the community of Aspendell; direct foliar spray with Aminopyralid
redstem stork's bill Above 8,000 ft	Summer Range	2	0.09	4	unlikely to treat; not rated by CDFA, limited impact by Cal-IPC, therefore minimal environmental impact; treatment options include hand-digging or direct foliar spray
prickly Russian thistle Above 8,000 ft	Summer Range	2	0.02	3	hand-pull prior to seed set; these would only be successful for isolated infestations, otherwise the adjacent seed source would quickly re-infest the treated area; typically occurs in disturbed areas e.g. roadsides, can spread into burns

common dandelion Above 8,000 ft	Summer Range	1	24.84	4	unlikely to treat; not rated by CDFA or Cal-IPC, therefore minimal environmental impact; treatment options include hand-digging or direct foliar spray
cheatgrass Above 8,000 ft	Summer Range	11	708.56	3	hand-pull small infestations; possibly spray with fluazifop (grass-specific herbicide); these would only be successful for isolated infestations, otherwise the adjacent seed source would quickly re-infest the treated area
Summer Range Totals		18	733.70		

Direct and Indirect Effects

The Proposed Action indirectly provides for a potential management approach for bighorn sheep which expresses the intent to expand the area occupied in unforested openings supporting productive plant communities with a variety of forage species in and near adequate steep rocky escape terrain throughout the elevational range (between 7,000 and 14,000 feet) within mountain ranges.

Implementation of the Proposed Action is expected to result in eventual eradication of the known sites of Priority 1 invasive species, and significant reduction in the extent of Priority 2 invasive species. Some control or eradication of select infestations of Priority 3 and 4 species is also likely to occur, but this is expected to be much more limited in extent. Many of these species are likely to continue to expand their footprint on the forest due to their ubiquitous nature, prolific seed production, and unavailable treatment method at the landscape scale (e.g. cheatgrass). These species are primarily addressed through prevention measures to reduce spread, or minimizing conditions which facilitate their expansion.

Future projects and activities within the range of bighorn sheep on the Inyo NF would be designed to maintain, move towards, or not preclude attaining suitable habitat. This will contribute to Recovery Task 1.2, to maintain and/or enhance integrity of bighorn sheep habitat. If treatments are needed to control and/or eradicate noxious weeds in SNBS habitat, the following design features incorporated into the Proposed Action would minimize effects to SNBS from project activities:

25. Within SNHBS occupied and critical habitat: manual treatment is the preferred method; herbicide application would be limited to direct foliar or hand application; potential for insect biological controls will be used. Mechanical treatments will not be used in known occupied habitat for SNBHS.
26. To minimize disturbance to SNBHS, weed treatments will not be conducted in known occupied lambing habitat during the lambing period, which typically occurs between April and mid-July.

Manual, Mechanical, Cultural, and Herbicide Treatments

Under the proposed action there will be no measurable effect to SNBS or their designated critical habitat from the use of herbicides to treat noxious and invasive species. The potential for future populations of noxious and invasive weeds to occur in SNBS habitat is very low due to the high elevation and rocky soil types associated with the species habitat as well as the lack of ground disturbance and vectors. Any noxious weeds that may potentially occur in this area would likely be single, isolated plants that could most likely effectively be treated with hand pulling and bagging techniques if identified soon after establishment. Herbicides would only be used in the rare instances when hand pulling was determined to not be effective and the threat of infestation of native plant communities was eminent.

Off-target drift and movement of chemicals through soils can occur when using herbicides. Drift is the movement of any herbicide through the air to areas not intended for treatment. Drift depends on droplet size, wind speed and direction, height above ground of the application, herbicide formulations and ambient temperature.

Movement of chemicals on soil through surface runoff and leaching can be a concern when using herbicides. Surface runoff is when water moves over the surface of a field or treated area that can carry herbicide with it. Leaching occurs when water carries herbicides into and ultimately out of the root zone. The portion lost to leaching depends on soil texture, herbicide solubility, and amount and intensity of rainfall. The greatest potential for herbicide in both runoff and leaching occurs when herbicide comes in contact with the soil surface followed by a precipitation event. During the Annual Implementation Process, project design features listed under Soil and Water Resources ensure herbicide residue on soil surfaces will be minimal and will result in minimal or no measureable impacts to aquatic species. Including but not limited to these design features:

34. State and Regional Water Quality Control Board certified Best Management Practices will be implemented. BMPs applied to all Forest projects are outlined in the Water Quality Management for Forest System Lands in California, BMP handbook and the National Core BMP Technical Guide (USDA Forest Service, 2012).
36. During the Annual Implementation Process, the Forest Watershed Specialist will review the treatment sites to determine if they occur on soils with low permeability and/or high water table. Broadcast and spot spray of aminopyralid and clopyralid would not occur in these areas.

To minimize the potential for spray drift to adjacent forage PCE (native vegetation) SNBS critical habitat, weeds would be prioritized for hand pulling if suitable otherwise individually treatments using hand pulling, the wicking and wiping method or the dipping and clipping technique. Both of these methods result in herbicide being applied to the main stem of the weed and greatly reduces the amount of herbicide needed to treat noxious weeds as well as the potential for inadvertent drift to non-target plant species. These methods also reduce the potential for surface runoff and/or leaching of herbicides into the soil because herbicide applications would only be applied to the main stem of the plant and not to the soil surface.

The primary use of direct foliar spray would be used within critical habitat most often in winter range and at high use areas when and where SNBS are least expected to occur. When working with herbicides there is a remote risk of accidental spills or other exposure scenarios other than those described above. To limit the potential for herbicide spills impacting SNBS or their habitat, is mitigated by design feature #6 Herbicide preparation will occur only on level, disturbed sites.

The following SERA examples briefly capture findings related to effects specific to mammals albeit not specifically to sheep but does include some herbivores and omnivores. Clopyralid in one long-term (8 year) field study has been conducted that indicates no substantial or significant effects on plant species diversity (Rice et al 1997). For chronic exposures, all HQs are below one (0.3) therefore there is no basis for asserting that adverse effects are likely from the application of clopyralid (FS). Fluazifop-P-butyl appears that canids are not a sensitive subgroup for exposures. While the toxicity of fluazifop-P-butyl to plants is understood relatively well, the mechanism of action in mammals is unclear. Subchronic and chronic toxicity studies have been done in dogs, hamsters, rabbits, and rats and no adverse effects are noted. Clethodim acute toxicity is classified as practically nontoxic as well.

The weight of evidence from available studies suggest that no adverse effects to mammals are plausible using typical or worst-case exposure assumptions at application rates proposed in this project. Hazard quotients for all exposure scenarios, at both the central and upper range, are well below one (the level where potential effects from doses are considered discountable). This indicates there is a low level of concern that application of these herbicides would negatively affect SNBS, especially considering the very low application rates that would be necessary to treat isolated individual weed species or small infestations that are likely to occur within SNBS habitat.

Review of SERA risk for triclopyr, however, indicates that HQs exceed the level of concern ($HQ > 1$) for exposures to mammals involving the consumption of contaminated vegetation. However, the HQs are based on worst case scenario exposures and do not account for factors such as timing and method of application, animal behavior and feeding strategies and/or implementation of project design criteria. Since treated plants will rapidly brown and die, they will not remain palatable or available as forage for more than about five to ten days following treatments, making the acute or the chronic scenario implausible. Furthermore, triclopyr would be used to potentially treat salt cedar tamarisk and other woody weeds, which currently occurs in the project area in limited numbers but not known within suitable foraging areas. The preferred treatment method is hand application using triclopyr is a hand-held applicator but spraying small plants or

resprouting shoots may be necessary in targeted situations to primarily treat woody species such as Siberian elm, tree of heaven, Russian olive, saltcedar that occur at low elevations as scattered, isolated populations.

Manual methods include hand digging individual plants and pulling and clipping flower heads and bagging them. Direct effects to SNBS from manual treatment methods include disturbance to sheep from human activity during activities. Sheep may flush from a treatment site and avoid the area while activities are occurring. Furthermore, just as with herbicide treatments, no manual treatments would occur during the lambing period to avoid disturbing SNBS during this critical period. Outside of this time period, hand pulling activities would likely be accomplished in one day and usually by no more than two people. Manual treatments may need to be repeated annually but would continue to require minimal disturbance. During the Annual Implementation Process for this project all prescriptions would continue to consider current management direction and emphasize management actions. Therefore, any effects to SNBS from manual weed treatments would be minimal and have no long term effects on the population.

Biological Control

Mulching and tarping methods are less likely to be used in habitat for SNBS as they are not feasible to maintain in the steep remote settings where SNBS are located. However, mulching and tarping may prove necessary for aggressive future infestations of Canadian thistle or Russian knapweed that can requires multiyear treatments to eliminate. These treatments would not occur during the critical period and generally be lowest preferred method. Summer treatments in winter SNBS range is the most likely treatment areas, particularly at high disturbance areas such as trail heads, administrative sites, and within road prism where infestations at likely to occur.

Effects to Critical Habitat

As described above, the majority of designated critical habitat for the Sierra Nevada bighorn sheep is within the Inyo NF, and most (94 percent) is within designated wilderness areas. Within designated wilderness, most active, ground-disturbing management (tarping), mechanical, and other vegetation management is inconsistent with maintaining the wilderness character required by the Wilderness Act of providing “...untrammelled, natural, undeveloped” qualities. *Therefore, in the event treatments that require these methods, such as large monocultures of weeds, justification of methods must require approval (MRDG) and be considered for other areas of resource concerns*

The Proposed Action will contribute to Recovery Task 1.2, to maintain and/or enhance integrity of bighorn sheep habitat, and Recovery Task 2.2.3, to enhance bighorn sheep winter range habitat to increase visibility where appropriate, and is consistent with Recovery Task 2.3.1 to prevent contact between bighorn sheep and domestic sheep or goats.

The primary constituent elements identified for the Sierra Nevada bighorn sheep include the presence of a variety of forage plants, as indicated by the presence of grasses (e.g., *Achnatherum* spp.; *Elymus* spp.) and browse (e.g., *Purshia* spp.) in winter none of which are invasive weeds.

Sierra Nevada bighorn sheep are a mountain dwelling ungulate whose life history is associated with the acquisition of food and mates in a rugged, topographically diverse landscape. In their search for optimal foraging habitat, Sierra Nevada bighorn sheep climb to elevations as high as 4,267 meters (14,000 feet) during the summer following green forage as it progresses up the mountains with increasing temperatures. They tend to remain at high elevations through the autumn breeding season (the rut) if weather permits. Few, if any, invasive weeds are documented or expected to be associated with PCE at high elevation rugged terrain. Therefore, disturbance to individuals or modification of PCE during summer implementation is unlikely.

The Proposed Action may indirectly affect this primary constituent element, as invasive plant species may provide forage for SNBS. To minimize potential disturbance to SNBS from weed treatment activities, herbicide application would be limited to directed foliar or hand application (see PDF-25) and all methods would not be conducted until after the lambing period in known occupied lambing habitat for SNBS (see PDF-26). Although lambing areas are still being understood as information becomes available this design feature will provide protection for ewes and their newborn lambs that may wander into the project area while the lambs are still young and vulnerable to disturbance.

The majority of weed locations within critical habitat are located in winter range at low elevation. Therefore, it is unlikely that herbicide treatments accomplished during the summer at low elevation would affect plants that provide food for Sierra bighorn in the winter. Implementing treatments in winter range during the season of use occurs in open desert environments on Inyo NF. The eastern Sierra front is more remote south of Bishop where residential influence occurs about every 50 miles while north of Bishop there is less gaps, higher density of residence and more activities overall. Along the foothills where SNBS are expected to occur are typically adjacent to open escarpments known to be used as escape routes. It is unlikely that implementing treatments will adversely affect individuals because the vantage point from such areas overlooks open sagebrush range that is expected to provide individuals adequate time to habituate and or retreat from weed crews and treatments.

Specific direction and attention to desirable forage plants (PCE #2) will be considered during the Annual Implementation Process to ensure weed treatment methods benefit critical habitat and achieve goals set forth in the recovery plan as well as these goals within the Inyo Forest Plan:

- Inyo, Diversity Goal: The Forest has achieved diversity of plant and animal communities by providing a threshold level of vegetation types and seral stages.
- Inyo Wildlife: Threatened, Endangered, and Sensitive Animal Species: Consider threatened and endangered species as below viability until recovery is achieved. Emphasize the protection and improvement of habitat for threatened or endangered wildlife. Manage for the protection and enhancement of all historically and potentially threatened or endangered species habitat as necessary to meet recovery levels.

Cumulative Effects

Under the proposed action cumulative effects to SNBS will be minimal and ultimately beneficial. As mentioned earlier, disease transmission from domestic sheep or goats is considered to be one of the greatest threats to bighorn sheep. Disease transmission can kill large numbers of bighorn sheep with devastating consequences, particularly for smaller, isolated herds. There is some potential for human disturbance associated with treatment efforts to cumulatively affect SNBS because in some locations they are already subject to disturbance from human recreation. However, because the potential for noxious weeds to occur in SNBS sheep is considered low, the need for weed treatments and thus potential human disturbance is expected to be minimal, and a design feature would limit human presence in the vicinity of lambing habitat during the critical time period.

According to the 2007 Recovery Plan, there are no immediate threats to habitat for SNBS (USDI 2007). Almost all of the critical habitat is considered stable and intact due to the majority of it occurring within Public ownership (U.S. Forest Service, National Park Service and Bureau of Land Management). In addition, the relatively high elevation of the habitat limits the number of roads and other types of disturbance that might be associated with public lands at lower elevations. Under the proposed action, there are no activities that would

add to or increase threats to critical habitat. As mentioned earlier, by locating and treating noxious weeds, native plant communities and high quality habitat SNBS would be maintained.

The biggest threat to bighorn sheep is disease transmission from domestic sheep. Loss of habitat from wildfires and invasion of non-native annual grasses also have become an increasing concern in bighorn sheep habitat. Within the last decade, wildfire has burned thousands of acres of wilderness. The CDFW also monitors mortality in Sierra Nevada bighorn sheep and manages mountain lion predation, as needed, in coordination with the USFWS, USDA Wildlife Services, and landowners, including the Inyo NF. It is anticipated that the CDFW and USFWS will continue to evaluate the risk of disease transmission from domestic livestock grazing on other non-federal lands and work with landowners and managers to reduce the risk where possible.

Some non-federal future actions, such as those identified in the section, Cumulative Effects Common to All Species, may affect this species and habitats in the plan area. The California Department of Fish and Wildlife conducts actions to help restore the Sierra Nevada bighorn sheep population throughout its range and as guided by the 2007 Recovery Plan. Specifically, the CDFW has and is expected to continue to conduct population surveys, evaluate and monitor mortality in bighorn sheep, and evaluate and implement translocation efforts as determined necessary to meet recovery plan distribution and population criteria.

Cumulatively, there are many existing weed vectors and influences that are causing weeds to spread into and within the project area. A warmer, drier climate may also lead to spread of weeds into higher elevations or new habitats. Non-native invasive species have prolific seeding rates that quickly colonize in disturbed settings. Wildfire events, in particular, can pose the highest risk for weed spread with bare ground, high nutrient availability and a lack of competing plants.

Treatments of newly discovered (currently unmapped) infestations or species of invasive plants would occur according to the Early Detection Rapid Response (EDRR) approach, which is designed to allow for control of new invasive plant infestations as soon as possible after their detection. EDRR treatments could occur outside of currently mapped infested areas, but treatments in these areas would still be subject to the Annual Implementation Process.

Given these and other potential nonfederal future actions, we do not anticipate a significant increase in the level of impacts to the species population in the plan area beyond what has already been noted in the analysis of effects resulting from implementing the Proposed Action.

Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by weed restoration activities, adoption of the Proposed Action *may affect, and is not likely to adversely affect* the Sierra Nevada bighorn sheep.

Where infestations occur, some disturbance to Sierra Nevada bighorn sheep may occur during manual and herbicide weed treatments. However, the disturbance will be minor, short term and will avoid the critical lambing period. The weight of evidence from available herbicide studies suggest that no adverse effects to mammals are plausible using typical or worst-case exposure assumptions at application rates proposed in this project. Herbicides selected for this project will be applied using a direct application method to individual noxious weeds which adds another layer of protection that would greatly limit exposure to Sierra Nevada bighorn sheep.

Because almost all critical habitat occurs in wilderness or inventoried roadless areas and this limits management actions, we determined that adoption of the Proposed Action *may affect and is not likely to adversely affect designated critical habitats* on the Inyo National Forest. This determination is further based on:

The limited ground disturbing activities proposed in critical habitat, the project design features associated with the Proposed Action, and the long term beneficial effects that will result from controlling and eradicating noxious weeds within critical habitat for Sierra Nevada bighorn sheep.

Determination

Key conclusions:

- Less than 1% Critical Habitat on Inyo NF is known to contain noxious weeds.
- Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.
- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- The following Project Design Features apply:
 25. Within SNBS critical habitat that contain PCEs: manual treatment is the preferred method and herbicide application would be limited to direct foliar or hand application.
 26. To minimize disturbance to SNBS, weed treatments will not be conducted in known occupied lambing habitat during the lambing period, which typically occurs between April and mid-July.

VIII. Literature Review

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Appendix A - Species Not Considered

The following species are not known to occur within the action area therefore are not anticipated to be impacted by proposed actions directly, indirectly or cumulatively.

North American wolverine

There are no contemporary verified or documented occurrences of the North American wolverine in the southern Sierra Nevada mountain range (Aubry, McKelvey, and Copeland 2007, United States Department of the Interior 2010). In 2008, a male wolverine was photographed at a camera station on the Tahoe NF, approximately 240 miles north of the Inyo NF (Moriarty et al. 2009, CNDDDB 2017). Genetic analysis of hair and scat revealed this animal was a male with genetic origin from the western edge of the Rocky Mountain region (Moriarty et al. 2009). This represented the most recent verified detection in California since the last documented occurrence in the 1950’s and the prior verified occurrence in 1922 (Aubry, McKelvey, and Copeland 2007). In February and May of 2016, a wolverine was again photographed on the Tahoe NF. This individual is believed to be the same one as photographed in 2008 but genetic results from this new detection have not been reported. The 2007 Aubrey et al. analysis examined records through 2005 and since that time, there are 2 other records of wolverine in the California Natural Diversity Database within the Inyo NF and one record reported within 50 miles of the Inyo NF (CNDDDB 2017). None of these records are considered verified or documented occurrences by definitive evidence such as specimens, photographs, hair or other physical evidence using definitions consistent with Aubry et al. (2007).

California condor

There are no contemporary documented occurrences of the California condor on the Inyo NF (CNDDDB 2017). The Blue Ridge National Wildlife Refuge, located in the San Joaquin Valley foothills west of the Sequoia NF, is the closest area specifically managed for California condor recovery (United States Department of the Interior 2013a), approximately 20 miles to the west of the southern portion of the Inyo NF. Currently, there is infrequent condor use of the Blue Ridge Refuge, estimated at one to two days a year, if any at all, but the general trend is one of increasing activity and it’s expected that use will increase over time as condor populations recover (United States Department of the Interior 2013a). Condor use of the Inyo NF is not expected to occur until more regular use of the Blue Ridge National Wildlife Refuge area occurs in the future.

Least Bell’s vireo

The least Bell’s vireo was formerly widespread and abundant throughout the Central Valley of California and other low-elevation riverine valleys; it also occurred in the Sierra Nevada foothills and the Coast Ranges; the range extended from Red Bluff (Tehama County) to northwestern Baja California, including populations in the Owens Valley, Death Valley, and the Mohave Desert (United States Department of the Interior 1986, 2006b). Now it is essentially extirpated from the Central Valley, although some re-colonization of the San Joaquin Valley may be occurring and there are some territories in the Owens Valley, outside of the Inyo NF (United States Department of the Interior 2006b). The number of territories has increased to 11 territorial locations, but there is some uncertainty whether these individuals are least Bell’s vireo or the more common Arizona Bell’s vireo (M., McCaskie, and Unitt 2003). These locations are well outside of the Inyo NF and would not be affected by management within the action area.

Yellow-billed cuckoo, western U.S. DPS

The western U.S. Distinct Population Segment of yellow-billed cuckoo occurs along the Owens River in the vicinity of the Inyo NF (United States Department of the Interior 2014a). No yellow-billed cuckoos are known to occur within the Inyo NF (CNDDDB 2017). Proposed critical habitat (Owens River; CA Unit 5) is identified along the Owens River that is owned and managed by the LADWP and would not be affected by management in the action area (United States Department of the Interior 2014a).

Western snowy plover, Pacific Coast population DPS

The Pacific Coast Distinct Population Segment of western snowy plover (*Charadrius nivosus nivosus*) is defined as “those individuals that nest adjacent to or near tidal waters, and includes all nesting colonies on the mainland coast, peninsulas, offshore islands, adjacent bays, and estuaries” (United States Department of the Interior 1993b). Generally it is considered as the populations within 50 miles of the Pacific Coast. critical habitat has been designated and exists entirely along the Pacific Coast and does not exist within or near the action area (United States Department of the Interior 2012). Four records of snowy plovers are documented between 1978 and 2004 in the California Natural Diversity Database in the vicinity of the Inyo NF, primarily in the Owens Valley (CNDDDB 2017). These occurrences are not referenced as part of the Pacific Coast DPS (United States Department of the Interior 1993b) and may be part of the larger inland population of snowy plover (United States Department of the Interior 2012).

Delta smelt and northern California DPS of steelhead

The Delta smelt (*Hypomesus transpacificus*) is associated with waters in the Sacramento-San Joaquin Delta (United States Department of the Interior 1993a) and the northern California Distinct Population Segment of steelhead (*Oncorhynchus mykiss*) is associated with rivers and waters of the Pacific Coast in northern California (United States Department of the Interior 2006a). Other Distinct Population Segments of steelhead occur within the California Central Valley that were not included on the official species list. Neither of these species occur on the Inyo NF which is almost entirely located on the east side of the Sierra Nevada mountain range.

Little Kern golden trout

The Little Kern golden trout occurs within the Little Kern River drainage that is located primarily within the Golden Trout Wilderness on the Sequoia NF, with additional smaller drainage areas on the Sequoia National Park and Sequoia NF (United States Department of the Interior 2011c). This watershed is located just west of the Inyo NF boundary and management within the action area would not affect this watershed.

Owens pupfish

The Owens pupfish occurs in the Owens Valley outside of the Inyo NF. The species is addressed in the Owens Basin Wetland and Aquatic Species Recovery Plan for Inyo and Mono Counties, California (United States Department of the Interior 1998). The recovery plan identifies several conservation areas for the recovery of the Owens pupfish, none of which are on National Forest System lands. The 5-Year Review for Owens Pupfish (United States Department of the Interior 2009b) does not identify recovery opportunities or threats relevant to the Inyo NF. This species will not be affected by the project.

Appendix B – Species Related Plan Components

The following selected plan components are relevant to the Proposed Action. This only includes direction specifically referencing or directly related to federally listed species. Other plan components that would indirectly guide projects and are not focused on federally listed species are not included here. Note that some direction relevant to federally listed species is also found in Appendix C specific fish and amphibians associated with aquatic and riparian Ecosystems

Forest-wide Direction Specific for Federally Listed Species

Inyo Forest Plan
<p>Inyo, Diversity Goal: The Forest has achieved diversity of plant and animal communities by providing a threshold level of vegetation types and seral stages.</p> <p>Inyo Wildlife: Threatened, Endangered, and Sensitive Animal Species: Consider threatened and endangered species as below viability until recovery is achieved. Emphasize the protection and improvement of habitat for threatened or endangered wildlife. Manage for the protection and enhancement of all historically and potentially threatened or endangered species habitat as necessary to meet recovery levels.</p> <p>Inyo Fish: Threatened and Endangered Fish S&G: Provide high quality habitat for threatened and endangered fish species based on the results of habitat capability modal analyses.</p>
<p>Inyo, Threatened, Endangered, or Sensitive Species Goal: The habitats of threatened or endangered animals are protected or improved to assist the recovery of the species in cooperation with state and other federal agencies.</p> <p>Inyo Wildlife: Threatened, Endangered, and Sensitive Animal Species: Cooperate with the Fish and Wildlife Service and California Department of Fish and Game in the management of threatened and endangered species and the restoration of habitat. Submit proposals for actions that might affect the continued existence of a threatened or endue species to the U.S. Fish and Wildlife Service for formal consultation.</p> <p>Inyo Fish: Threatened and Endangered Fish S&G: Rehabilitate and maintain essential habitat for these species according to species' recovery plans and Memoranda of Understanding with the California Department of Fish and Game and the U.S. Fish and Wildlife Service.</p>
<p>Inyo, Threatened, Endangered, or Sensitive Species Goal: The habitats of threatened or endangered animals are protected or improved to assist the recovery of the species in cooperation with state and other federal agencies.</p>
<p>Inyo, Protection, Standard and Guideline: Consider both existing conditions and the effect of future management activities in the area surrounding the project area when developing treatment standards for fuels.</p> <p>Inyo, Protection, Standard and Guideline: The Forest Service mission in fire management is to use fire as a resource management tool.</p>
<p>Inyo, Protection, Standard and Guideline: Use Prescriptions and Management Area Direction and fire management action plans when determining the appropriate wildfire suppression strategy.</p>

Sierra Nevada Bighorn Sheep

Inyo Forest Plan
<p>Sierra Nevada mountain sheep and Nelson mountain sheep Standard and Guideline 1: Maintain existing mountain sheep habitat. Where feasible, expand their ranges by transplanting animals to suitable unoccupied habitats as per the criteria stated in the Sierra Nevada Mountain Sheep Recovery Plan.</p> <p>Sierra Nevada mountain sheep and Nelson mountain sheep Standard and Guideline 5: If reintroduced mountain sheep establish themselves in drainages outside the reintroduction sites, take advantage of opportunities to extend mountain sheep range, consistent with other resource activities.</p> <p>Sierra Nevada mountain sheep and Nelson mountain sheep Standard and Guideline 7: Provide for the long-term viability of Sierra Nevada and Nelson mountain sheep populations by promoting reestablishment of these species into suitable habitat within historic range, giving preference to areas with no current livestock use and consistent with other resource activities.</p> <p>Mountain Sheep Habitat Management Prescription (#3) – Wildlife: Evaluate potential transplant sites, giving preference to sites that have no current livestock grazing.</p>
<p>Sierra Nevada mountain sheep and Nelson mountain sheep Standard and Guideline 2: Permit no increase in existing livestock use if the increase is shown to be deleterious to mountain sheep populations as defined in the Recovery Plan.</p> <p>Sierra Nevada mountain sheep and Nelson mountain sheep Standard and Guideline 3: Maintain the health of established mountain sheep populations. If disease transmission from domestic livestock is shown to be deleterious to mountain sheep populations, find ways to alleviate this problem.</p> <p>Sierra Nevada mountain sheep and Nelson mountain sheep Standard and Guideline 4: Prohibit the conversion of livestock type from cattle to sheep on or adjacent to existing or approved reintroduction sites for mountain sheep.</p> <p>Mountain Sheep Habitat Management Prescription (#3) – Range: Permit no increase in livestock use if the increase is shown to be deleterious to maintain sheep populations.</p>
<p>Sierra Nevada mountain sheep and Nelson mountain sheep Standard and Guideline 6: Develop and implement a recovery and conservation plan for Nelson sheep similar to the one devised for Sierra Nevada sheep. Update the Sierra Nevada Mountain Sheep Plan.</p>
<p>Designated Wilderness (#1, #2), Wildlife: Manage mountain sheep habitat to maintain and/or enhance carrying capacity. Relocate existing or construct new recreation trails only in areas where the trails will rot cause significant adverse effects upon the use by mountain sheep of their habitat. Identify and provide for this sensitivity in the appropriate wilderness management plan.</p>

Inyo Forest Plan
Mountain Sheep Habitat Management Prescription (#3) - Facilities: Locate trails and manage their use so they do not conflict with maintain sheep habitat. Establish no roads or heliports where they would conflict with mountain sheep. Mountain Sheep Habitat Management Prescription (#3) – Recreation: Resolve conflicts between mountain sheep and hang gliding in favor of mountain sheep. Designated Wilderness (#1), Wilderness: Redirect or restrict use where necessary to restore impaired wilderness resources.
Mountain Sheep Habitat Management Prescription (#3) – Minerals: Commensurate with the sensitivity of Mountain sheep on their wintering grounds, work with claimants and mineral operators to limit mineral exploration and development activities- within mountain sheep winter range during the period when the animals are using the winter range.

Lahontan Cutthroat Trout

Inyo Forest Plan
Fish – Threatened and Endangered Fish 3: Manage all stream reaches of essential habitat as depicted in the Recovery Plan to the following guidelines in consultation with the U.S. Fish and Wildlife Service. <ul style="list-style-type: none">1. Do not allow any activity that results in more than 10 percent degradation of the habitat within any given stream reach; this conclusion must be supported by data that results from the use of a quantitative methodology survey such as GAWS, COWFISH, etc.2. Restore unstable or eroding streambanks to attain a streambank system that is no more than 10 percent unstable at any given time.3. Retain vegetation adjacent to perennial streams that affords stream shading and streambank stability.
Fish – Threatened and Endangered Fish 4: Prohibit stream-modifying construction activities within or immediately adjacent to the aquatic zone during the following spawning seasons: <ul style="list-style-type: none">1. in streams with spring spawning species (rainbow, cutthroat, and golden trout), February 15-August 20;2. in streams with fall spawning species (brown and brook trout), October 1-April 15. Exceptions to (1) and (2) above must be approved by the Forest Supervisor.

Paiute Cutthroat Trout

Existing Forest Plan
Fish – Threatened and Endangered Fish 3: Manage all stream reaches of essential habitat as depicted in the Recovery Plan to the following guidelines in consultation with the U.S. Fish and Wildlife Service. <ul style="list-style-type: none">1. Do not allow any activity that results in more than 10 percent degradation of the habitat within any given stream reach; this conclusion must be sued by data that results from the use of a quantitative methodology survey such as GANS, COWFISH, etc.2. Restore unstable or eroding streambanks to attain a streambank system that is no more than 10 percent unstable at any given time.3. Retain vegetation adjacent to perennial streams that affords stream shading and streambank stability.
Fish – Threatened and Endangered Fish 4: Prohibit stream-modifying construction activities within or immediately adjacent to the aquatic zone during the following spawning seasons: <ul style="list-style-type: none">1. in streams with spring spawning species (rainbow, cutthroat, and golden trout), February 15-August 20;2. in streams with fall spawning species (brown and brook trout), October 1-April 15. Exceptions to (1) and (2) above must be approved by the Forest Supervisor.

Yosemite Toad and Mountain Yellow-legged Frogs

Inyo Forest Plan
SNFPA-98: Within 500 feet of known occupied sites for the California red-legged frog, Cascades frog, Yosemite toad, foothill yellow-legged frog, mountain yellow-legged frog, and northern leopard frog, design pesticide applications to avoid adverse effects to individuals and their habitats.

Appendix C – Plan Components for Aquatic and Riparian Ecosystems

Aquatic and Riparian Ecosystems

Inyo Forest Plan
<p>SNFPA CAR Designation: Critical aquatic refuges (CARs) are subwatersheds, generally ranging between 10,000 to 40,000 acres, with some as small 500 acres and some as large as 100,000 acres, that contain either:</p> <ul style="list-style-type: none">known locations of threatened, endangered, or sensitive species,highly vulnerable populations of native plant or animal species, orlocalized populations of rare native aquatic- or riparian-dependent plant or animal species. <p>Critical aquatic refuges are shown on maps in Volume 4, Appendix I of the SNFPA FEIS (January 2001), beginning on page I-53. The boundaries of CARs may be refined during landscape analysis based on the findings from conservation assessments or verification of the presence and condition of habitat for threatened, endangered, and sensitive species. Additional CARs may be added by individual national forests.</p> <p>SNFPA CAR DC: Critical aquatic refuges provide habitat for native fish, amphibian and aquatic invertebrate populations. Remnant plant and animal populations in aquatic communities are maintained and restored.</p> <p>SNFPA CAR DC: Streams in meadows, lower elevation grasslands, and hardwood ecosystems have vegetation and channel bank conditions that approach historic potential.</p> <p>SNFPA CAR DC: Water quality meets State stream standards</p>
<p>SNFPA RCA Designation: Riparian conservation area (RCA) widths are described below. RCA widths shown below may be adjusted at the project level if a landscape analysis has been completed and a site-specific RCO analysis demonstrates a need for different widths.</p> <ul style="list-style-type: none">Perennial Streams: 300 feet on each side of the stream, measured from the bank full edge of the streamSeasonally Flowing Streams (includes intermittent and ephemeral streams): 150 feet on each side of the stream, measured from the bank full edge of the streamStreams in Inner Gorge¹: top of inner gorgeSpecial Aquatic Features² or Perennial Streams with Riparian Conditions extending more than 150 feet from edge of streambank or Seasonally Flowing streams with riparian conditions extending more than 50 feet from edge of streambank: 300 feet from edge of feature or riparian vegetation, whichever width is greaterOther hydrological or topographic depressions without a defined channel: RCA width and protection measures determined through project level analysis. <p>¹. Inner gorge is defined by stream adjacent slopes greater than 70 percent gradient</p> <p>². Special Aquatic Features include: lakes, wet meadows, bogs, fens, wetlands, vernal pools, and springs</p> <p>SNFPA 91: Designate riparian conservation area (RCA) widths as described in Part B of this appendix. The RCA widths displayed in Part B may be adjusted at the project level if a landscape analysis has been completed and a site-specific RCO analysis demonstrates a need for different widths.</p>
<p>SNFPA RCA DC (1): Water quality meets the goals of the Clean Water Act and Safe Drinking Water Act; it is fishable, swimmable, and suitable for drinking after normal treatment.</p>
<p>SNFPA RCA DC (2): Habitat supports viable populations of native and desired non-native plant, invertebrate, and vertebrate riparian and aquatic-dependent species. New introductions of invasive species are prevented. Where invasive species are adversely affecting the viability of native species, the appropriate State and Federal wildlife agencies have reduced impacts to native populations.</p>
<p>SNFPA RCA DC (3): Species composition and structural diversity of plant and animal communities in riparian areas, wetlands, and meadows provide desired habitat conditions and ecological functions.</p>
<p>SNFPA RCA DC (4): The distribution and health of biotic communities in special aquatic habitats (such as springs, seeps, vernal pools, fens, bogs, and marshes) perpetuates their unique functions and biological diversity.</p>
<p>SNFPA RCA DC (5): Spatial and temporal connectivity for riparian and aquatic-dependent species within and between watersheds provides physically, chemically and biologically unobstructed movement for their survival, migration and reproduction.</p>
<p>SNFPA RCA DC (6): The connections of floodplains, channels, and water tables distribute flood flows and sustain diverse habitats.</p>
<p>SNFPA RCA DC (7): Soils with favorable infiltration characteristics and diverse vegetative cover absorb and filter precipitation and sustain favorable conditions of stream flows.</p>
<p>SNFPA RCA DC (8): In-stream flows are sufficient to sustain desired conditions of riparian, aquatic, wetland, and meadow habitats and keep sediment regimes as close as possible to those with which aquatic and riparian biota evolved.</p> <p>The physical structure and condition of stream banks and shorelines minimizes erosion and sustains desired habitat diversity.</p>
<p>SNFPA RCA DC (9): The ecological status of meadow vegetation is late seral (50 percent or more of the relative cover of the herbaceous layer is late seral with high similarity to the potential natural community). A diversity of age classes of hardwood shrubs is present and regeneration is occurring.</p>
<p>SNFPA RCA DC (10): Meadows are hydrologically functional. Sites of accelerated erosion, such as gullies and headcuts are stabilized or recovering. Vegetation roots occur throughout the available soil profile. Meadows with perennial and intermittent streams have the following characteristics: (1) stream energy from high flows is dissipated, reducing erosion and improving water quality, (2) streams filter sediment and capture bedload, aiding floodplain development, (3) meadow conditions enhance floodwater retention and groundwater recharge, and (4) root masses stabilize stream banks against cutting action.</p>
<p>SNFPA 92: Evaluate new proposed management activities within CARs and RCAs during environmental analysis to determine consistency with the riparian conservation objectives at the project level and the AMS goals for the landscape. Ensure that appropriate mitigation measures are enacted to (1) minimize the risk of activity-related sediment entering aquatic systems and (2) minimize impacts to habitat for aquatic- or riparian-dependent plant and animal species.</p>
<p>SNFPA 93: Identify existing uses and activities in CARs and RCAs during landscape analysis. At the time of permit reissuance, evaluate and consider actions needed for consistency with RCOs.</p>
<p>SNFPA 94: As part of project-level analysis, conduct peer reviews for projects that propose ground-disturbing activities in more than 25 percent of the RCA or more than 15 percent of a CAR.</p>
<p>SNFPA 95: For waters designated as “Water Quality Limited” (Clean Water Act Section 303(d)), participate in the development of Total Maximum Daily Loads (TMDLs) and TMDL Implementation Plans. Execute applicable elements of completed TMDL Implementation Plans.</p>
<p>SNFPA 96: Ensure that management activities do not adversely affect water temperatures necessary for local aquatic- and riparian-dependent species assemblages.</p>

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SNFPA 97: Limit pesticide applications to cases where project level analysis indicates that pesticide applications are consistent with riparian conservation objectives.
SNFPA-98: Within 500 feet of known occupied sites for the California red-legged frog, Cascades frog, Yosemite toad, foothill yellow-legged frog, mountain yellow-legged frog, and northern leopard frog, design pesticide applications to avoid adverse effects to individuals and their habitats.
SNFPA 99: Prohibit storage of fuels and other toxic materials within RCAs and CARs except at designated administrative sites and sites covered by a Special Use Authorization. Prohibit refueling within RCAs and CARs unless there are no other alternatives. Ensure that spill plans are reviewed and up-to-date.
SNFPA 100: Maintain and restore the hydrologic connectivity of streams, meadows, wetlands, and other special aquatic features by identifying roads and trails that intercept, divert, or disrupt natural surface and subsurface water flow paths. Implement corrective actions where necessary to restore connectivity.
SNFPA 101: Ensure that culverts or other stream crossings do not create barriers to upstream or downstream passage for aquatic-dependent species. Locate water drafting sites to avoid adverse effects to in stream flows and depletion of pool habitat. Where possible, maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows, wetlands, and other special aquatic features.
SNFPA 102: Prior to activities that could adversely affect streams, determine if relevant stream characteristics are within the range of natural variability. If characteristics are outside the range of natural variability, implement mitigation measures and short-term restoration actions needed to prevent further declines or cause an upward trend in conditions. Evaluate required long-term restoration actions and implement them according to their status among other restoration needs.
SNFPA 103: Prevent disturbance to streambanks and natural lake and pond shorelines caused by resource activities (for example, livestock, off-highway vehicles, and dispersed recreation) from exceeding 20 percent of stream reach or 20 percent of natural lake and pond shorelines. Disturbance includes bank sloughing, chiseling, trampling, and other means of exposing bare soil or cutting plant roots. This standard does not apply to developed recreation sites, sites authorized under Special Use Permits and designated off-highway vehicle routes.
SNFPA 104: In stream reaches occupied by, or identified as “essential habitat” in the conservation assessment for, the Lahonton and Paiute cutthroat trout and the Little Kern golden trout, limit streambank disturbance from livestock to 10 percent of the occupied or “essential habitat” stream reach. (Conservation assessments are described in the record of decision.) Cooperate with State and Federal agencies to develop streambank disturbance standards for threatened, endangered, and sensitive species. Use the regional streambank assessment protocol. Implement corrective action where disturbance limits have been exceeded.
SNFPA 105: At either the landscape or project-scale, determine if the age class, structural diversity, composition, and cover of riparian vegetation are within the range of natural variability for the vegetative community. If conditions are outside the range of natural variability, consider implementing mitigation and/or restoration actions that will result in an upward trend. Actions could include restoration of aspen or other riparian vegetation where conifer encroachment is identified as a problem.
SNFPA 106: Cooperate with Federal, Tribal, State and local governments to secure in stream flows needed to maintain, recover, and restore riparian resources, channel conditions, and aquatic habitat. Maintain in stream flows to protect aquatic systems to which species are uniquely adapted. Minimize the effects of stream diversions or other flow modifications from hydroelectric projects on threatened, endangered, and sensitive species.
SNFPA 107: For exempt hydroelectric facilities on national forest lands, ensure that special use permit language provides adequate in stream flow requirements to maintain, restore, or recover favorable ecological conditions for local riparian- and aquatic-dependent species.
SNFPA 108: Determine if the level of coarse large woody debris (CWD) is within the range of natural variability in terms of frequency and distribution and is sufficient to sustain stream channel physical complexity and stability. Ensure proposed management activities move conditions toward the range of natural variability.
SNFPA 110: Use screening devices for water drafting pumps. (Fire suppression activities are exempt during initial attack.) Use pumps with low entry velocity to minimize removal of aquatic species, including juvenile fish, amphibian egg masses and tadpoles, from aquatic habitats.
SNFPA 112: Post-wildfire management activities in RCAs and CARs should emphasize enhancing native vegetation cover, stabilizing channels by non-structural means, minimizing adverse effects from the existing road network, and carrying out activities identified in landscape analyses. Post-wildfire operations shall minimize the exposure of bare soil.
SNFPA 113: Allow hazard tree removal within RCAs or CARs. Allow mechanical ground disturbing fuels treatments, salvage harvest, or commercial fuelwood cutting within RCAs or CARs when the activity is consistent with RCOs. Utilize low ground pressure equipment, helicopters, over the snow logging, or other non-ground disturbing actions to operate off of existing roads when needed to achieve RCOs. Ensure that existing roads, landings, and skid trails meet Best Management Practices. Minimize the construction of new skid trails or roads for access into RCAs for fuel treatments, salvage harvest, commercial fuelwood cutting, or hazard tree removal.
SNFPA 114: As appropriate, assess and document aquatic conditions following the Regional Stream Condition Inventory protocol prior to implementing ground disturbing activities within suitable habitat for California red-legged frog, Cascades frog, Yosemite toad, foothill and mountain yellow-legged frogs, and northern leopard frog.
SNFPA 115: During fire suppression activities, consider impacts to aquatic- and riparian-dependent resources. Where possible, locate incident bases, camps, helibases, staging areas, helispots, and other centers for incide activities outside of RCAs or CARs. During pre-suppression planning, determine guidelines for suppression activities, including avoidance of potential adverse effects to aquatic- and riparian-dependent species as a goal.
SNFPA 116: Identify roads, trails, OHV trails and staging areas, developed recreation sites, dispersed campgrounds, special use permits, grazing permits, and day use sites during landscape analysis. Identify conditions that degrade water quality or habitat for aquatic and riparian-dependent species. At the project level, evaluate and consider actions to ensure consistency with standards and guidelines or desired conditions.
SNFPA 117: Assess the hydrologic function of meadow habitats and other special aquatic features during range management analysis. Ensure that characteristics of special features are, at a minimum, at Proper Functioning Condition, as defined in the appropriate Technical Reports (or their successor publications): (1) “Process for Assessing PFC” TR 1737-9 (1993), “PFC for Lotic Areas” USDI TR 1737-15 (1998) or (2) “PFC for Lentic Riparian-Wetland Areas” USDI TR 1737-11 (1994).
SNFPA 118: Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems. During project analysis, survey, map, and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans, and wheeled vehicles. Criteria for defining bogs and fens include, but are not limited to, presence of: (1) sphagnum moss (Spagnum spp.), (2) mosses belonging to the genus Meessia, and (3)

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sundew (Drosera spp.) Complete initial plant inventories of bogs and fens within active grazing allotments prior to re-issuing permits.
SNFPA 119: Locate new facilities for gathering livestock and pack stock outside of meadows and riparian conservation areas. During project-level planning, evaluate and consider relocating existing livestock facilities outside of meadows and riparian areas. Prior to re-issuing grazing permits, assess the compatibility of livestock management facilities located in riparian conservation areas with riparian conservation objectives.
SNFPA 120: Under season-long grazing: <ul style="list-style-type: none">For meadows in early seral status: limit livestock utilization of grass and grass-like plants to 30 percent (or minimum 6-inch stubble height).For meadows in late seral status: limit livestock utilization of grass and grass-like plants to a maximum of 40 percent (or minimum 4-inch stubble height). <p>Determine ecological status on all key areas monitored for grazing utilization prior to establishing utilization levels. Use Regional ecological scorecards and range plant list in regional range handbooks to determine ecological status. Analyze meadow ecological status every 3 to 5 years. If meadow ecological status is determined to be moving in a downward trend, modify or suspend grazing. Include ecological status data in a spatially explicit Geographical Information System database.</p> <p>Under intensive grazing systems (such as rest-rotation and deferred rotation) where meadows are receiving a period of rest, utilization levels can be higher than the levels described above if the meadow is maintained in late seral status and meadow-associated species are not being impacted. Degraded meadows (such as those in early seral status with greater than 10 percent of the meadow area in bare soil and active erosion) require total rest from grazing until they have recovered and have moved to mid- or late seral status.</p>
SNFPA 121: Limit browsing to no more than 20 percent of the annual leader growth of mature riparian shrubs and no more than 20 percent of individual seedlings. Remove livestock from any area of an allotment when browsing indicates a change in livestock preference from grazing herbaceous vegetation to browsing woody riparian vegetation.
SNFPA 122: Recommend restoration practices in: (1) areas with compaction in excess of soil quality standards, (2) areas with lowered water tables, or (3) areas that are either actively down cutting or that have historic gullies. Identify other management practices, for example, road building, recreational use, grazing, and timber harvests that may be contributing to the observed degradation.
SNFPA 123: Determine which critical aquatic refuges or areas within critical aquatic refuges are suitable for mineral withdrawal. Propose these areas for withdrawal from location and entry under U.S. mining laws, subject to valid existing rights, for a term of 20 years.
SNFPA 124: [<i>Within CARs</i>] Approve mining-related plans of operation if measures are implemented that contribute toward the attainment or maintenance of aquatic management strategy goals.
Inyo Fish: Fisheries S&G: Manage all stream reaches of all state designated wild trout waters according to the following: <ol style="list-style-type: none">Any activity that results in trampling and chiseling should not exceed 10 percent of any given stream reach. A reach is defined as a continuous portion of a stream with homogeneous physical characteristics.Restore unstable or eroding streambanks to attain a streambank system that is no more than 10 percent unstable at any given time.Streamside vegetation should provide a minimum of 90 percent of the habitat's capability to provide stream shading and fish cover.

Appendix D – Species-Specific Treatment Strategy and Methods

Mapped infestations, treatment strategy, and treatment methods for all currently known invasive plant species on the Inyo NF. Population and acreage information from Inyo NF Weed Inventory Database (NRIS); treatment methods from Di Thomas et al. (2013), Invasive Species Specialist Group (2008), Tu et al. (2001), and UC Agriculture and Natural Resources (2015). See Table 2 for specific biocontrol agents. There are no invasive plants mapped within RNAs as of January 2018.

Scientific Name	Common Name	# of Popn's	Acres	Occurs in Wilderness	Hand pull/ Dig/Cut	Mow	Tarp/ Solarize	Graze	Flame/ Torch	Bio-control	Animopyralid	Chlorsulfuron	Clethodim	Clopyralid	Fluazifop	Glyphosate	Imazapyr	Triclopyr
Treatment Strategy 1: Eradicate																		
<i>Acroptilon repens</i>	Russian knapweed	2	0.6		x	x				x	x	x		x		x		
<i>Ailanthus altissima</i>	tree of heaven	1	0.5		x						x	x				x	x	x
<i>Centaurea diffusa</i>	diffuse knapweed	4	32		x	x	x		x	x	x	x		x		x	x	
<i>Centaurea solstitialis</i>	yellow star-thistle	2	0		x			x	x		x	x		x		x	x	x
<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	spotted knapweed	5	9		x					x	x	x		x		x		
<i>Cirsium arvense</i>	Canada thistle	1	0.2			x					x	x		x		x	x	
<i>Lepidium appelianum</i>	hairy whitetop	6	3			x	x				x	x				x	x	
<i>Lepidium chalepensis</i>	lens-podded hoary cress	2	4			x	x				x	x				x	x	
<i>lepidium draba</i>	heart-podded hoary cress	1	0.002			x	x				x	x				x	x	
<i>Lepidium latifolium</i>	perennial pepperweed	9	5	x	x		x	x				x				x	x	
<i>Linaria dalmatica</i>	Dalmatian toadflax	1	1		x	x		x		x	x	x				x	x	
<i>Linaria vulgaris</i>	butter and eggs	3	2		x	x				x	x	x				x	x	
<i>Spartium junceum</i>	Spanish broom	1	1.3		x					x						x	x	x
Treatment Strategy 2: Control																		
<i>Dipsacus fullonum</i>	Fuller's teasel	2	0.2		x			x	x		x	x		x		x		

Scientific Name	Common Name	# of Popn's	Acres	Occurs in Wilderness	Hand pull/ Dig/Cut	Mow	Tarp/ Solarize	Graze	Flame/ Torch	Bio-control	Animoppyralid	Chlorsulfuron	Clethodim	Clopyralid	Fluazifop	Glyphosate	Imazapyr	Triclopyr
<i>Elaeagnus angustifolia</i>	Russian olive	3	0.1	x	x				x							x	x	x
<i>Halogeton glomeratus</i>	saltlover	29	787	x	x						x	x				x		
<i>Rubus armeniacus</i>	Himalayan blackberry	2	0.04		x				x							x		x
<i>Saponaria officinalis</i>	bouncingbet	7	28		x						x	x		x		x	x	x
<i>Tamarix ramosissima</i>	saltcedar	63	613	x	x			x		x						x	x	x
<i>Tribulus terrestris</i>	puncturevine	3	3		x					x		x				x	x	
<i>Ulmus pumila</i>	Siberian elm	3	0.6		x											x	x	x
Treatment Strategy 3: Contain																		
<i>Bassia hyssopifolia</i>	fivehorn smotherweed	12	48	x	x	x					x	x				x	x	
<i>Bromus madritensis</i> ssp. <i>rubens</i>	red brome	131	5,162	x	x			x		x	x	x	x		x	x	x	
<i>Bromus tectorum</i>	Cheatgrass	431	32,286	x	x					x	x	x	x		x	x	x	
<i>Cirsium vulgare</i>	bull thistle	9	451	x	x	x		x	x	x	x	x		x			x	x
<i>Convolvulus arvensis</i>	field bindweed	1	1		x		x				x	x				x	x	x
<i>Hirschfeldia incana</i>	shortpod mustard	1	0.003		x							x				x		
<i>Holcus lanatus</i>	common velvetgrass	2	57	x	x			x	x						x	x		
<i>Lotus corniculatus</i>	bird's-foot trefoil	3	4	x	x						x			x		x		x
<i>Marubium vulgare</i>	Horehound	4	4		x													x
<i>Melilotus</i> sp.	sweetclover	46	143	x	x				x							x	x	x
<i>Penstemon subglaber</i>	smooth penstemon	4	3		x		x									x		
<i>Robinia pseudoacacia</i>	black locust	3	39								x			x		x	x	x
<i>Salsola tragus</i>	prickly Russian thistle	169	1,977	x	x	x		x	x	x	x	x				x	x	x

Scientific Name	Common Name	# of Popn's	Acres	Occurs in Wilderness	Hand pull/ Dig/Cut	Mow	Tarp/ Solarize	Graze	Flame/ Torch	Bio-control	Animopyralid	Chlorsulfuron	Clethodim	Clopyralid	Fluazifop	Glyphosate	Imazapyr	Triclopyr
<i>Sonchus oleraceus</i>	common sowthistle	1	0.2		x			x						x		x		
Treatment Strategy 4: Limited or No Treatment																		
<i>Bromus diandrus</i>	ripgut brome	6	3		x	x		x		x	x	x	x		x	x	x	
<i>Bromus japonicus</i>	field brome	2	5		x			x	x	x	x	x				x		
<i>Ceratocephala testiculata</i>	curveseed butterwort	4	1								x	x				x	x	
<i>Chorispora tenella</i>	crossflower	2	2		x						x	x				x		
<i>Descurainia sophia</i>	herb sophia	72	939	x	x											x		
<i>Erodium cicutarium</i>	redstem stork's bill	38	287	x	x				x		x	x				x	x	
<i>Grindelia squarrosa</i> var. <i>serrulata</i>	curlycup gumweed	2	13.7		x						x	x				x	x	
<i>Hordeum murinum</i>	foxtail barley	1	0.004		x	x			x				x		x	x	x	
<i>Lactuca serriola</i>	prickly lettuce	5	0.3		x	x					x			x		x		
<i>Malva neglecta</i>	common mallow	6	3		x													
<i>Poa bulbosa</i>	bulbous bluegrass	7	2		x			x					x			x	x	
<i>Polygonum arenastrum</i>	oval-leaf knotweed	18	32	x	x						x					x	x	
<i>Polygonum aviculare</i>	prostrate knotweed	1	0.01		x						x					x	x	
<i>Polypogon monspeliensis</i>	annual rabbitsfoot grass	7	1	x	x	x		x	x			x	x		x	x	x	
<i>Rumex crispus</i>	curly dock	3	15			x					x	x		x		x	x	x
<i>Schismus arabicus</i>	Arabian schismus	32	181	x				x					x		x	x		
<i>Sisymbrium altissimum</i>	tall tumbled mustard	50	158	x	x	x	x	x	x		x	x				x	x	x
<i>Spergularia rubra</i>	red sandspurry	2	1		x											x		
<i>Taraxacum officinale</i>	common dandelion	52	2,056	x	x											x		

Scientific Name	Common Name	# of Popn's	Acres	Occurs in Wilderness	Hand pull/ Dig/Cut	Mow	Tarp/ Solarize	Graze	Flame/ Torch	Bio-control	Animopyralid	Chlorsulfuron	Clethodim	Clopyralid	Fluazifop	Glyphosate	Imazapyr	Triclopyr
<i>Tragopogon dubius</i>	yellow salsify	13	368	x	x			x								x		
<i>Trifolium repens</i>	white clover	1	0.1		x		x									x		
<i>Verbascum thapsus</i>	common mullein	58	107	x	x	x					x	x				x	x	
<i>Vulpia myuros</i>	annual fescue	3	5		x			x	x				x		x	x		